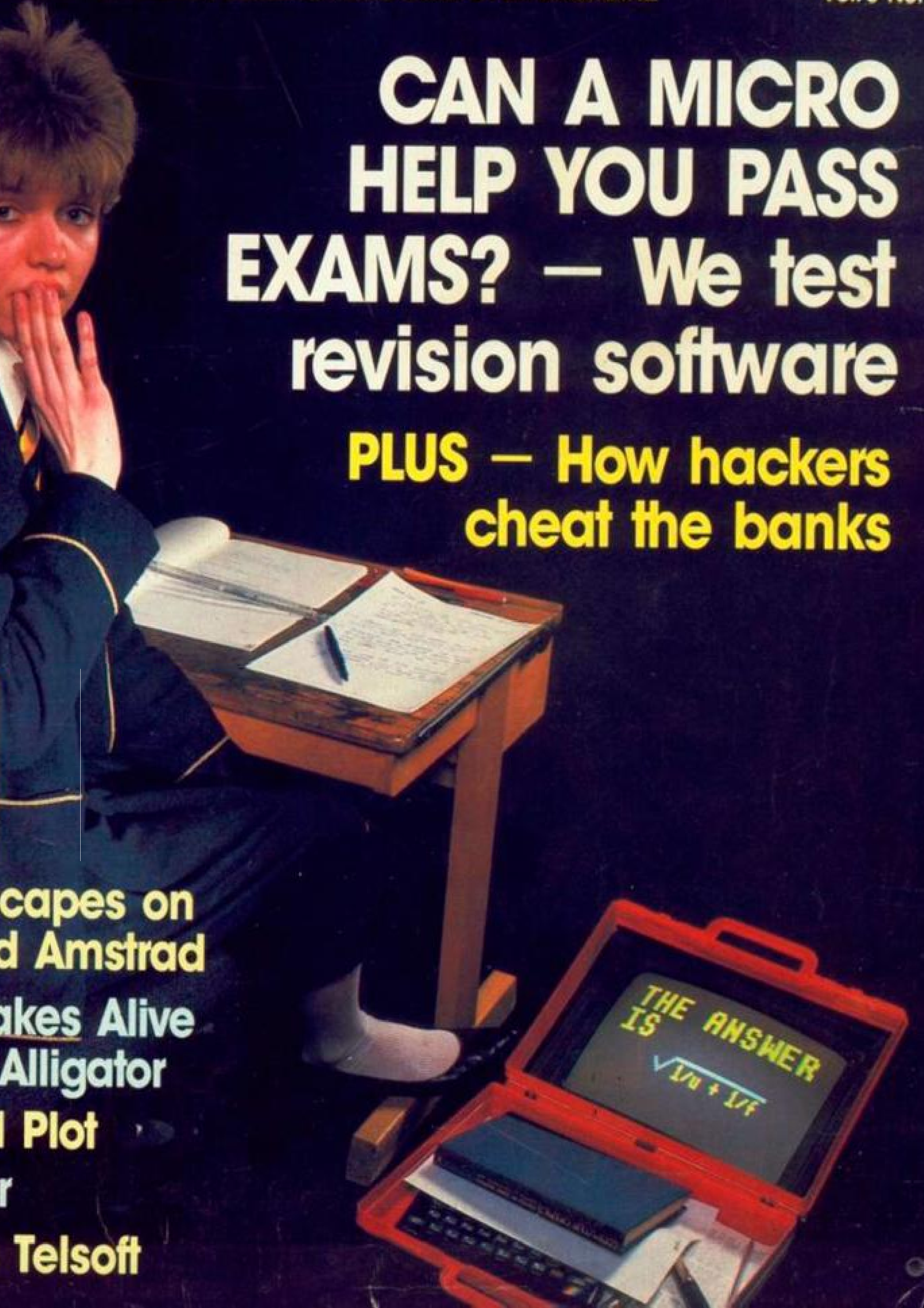
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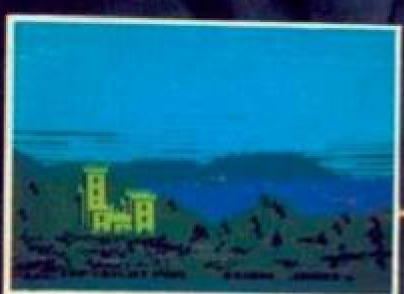
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MAY 1985
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Vol. 5 No. 5



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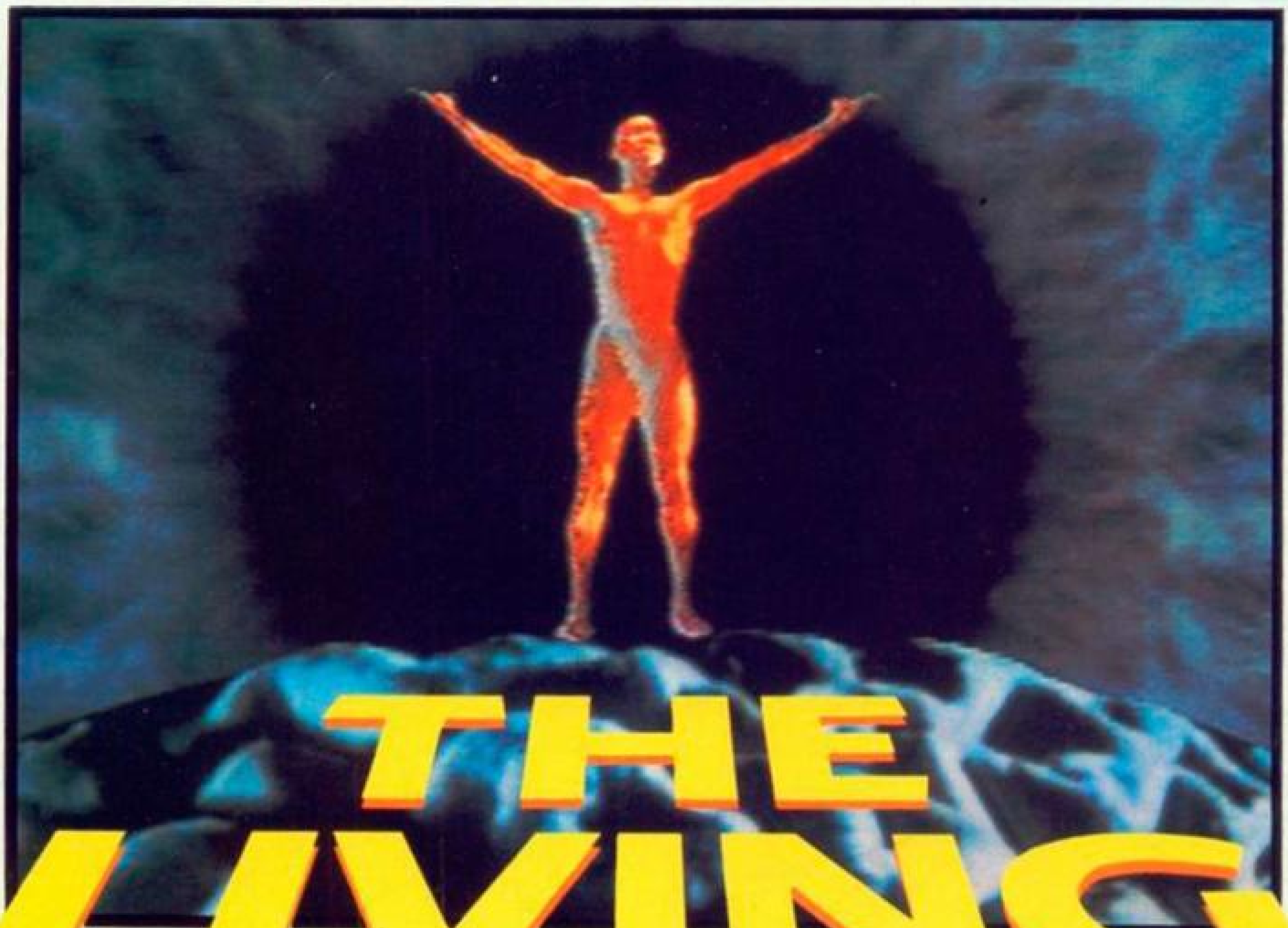
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Spectrum Snakes Alive and CBM-64 Alligator

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48K SPECTRUM · COMMODORE 64 · BBC 'B' · ELECTRON

YOUR COMPUTER Contents

MAY 1985



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Win an Enterprise: page 51.



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39 SOFTWARE SHORTLIST: Dogfight with Mirrorsoft's Spitfire 40; Beyond's Shadowfire with stunning icon graphics; Flyer Fox talking flight — all the hits and more.

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51 COMPETITION: Beat the system, win an Enterprise. What sort of a sneaky add-on would you like to have on your computer?

52 CAN A MICRO HELP YOU PASS EXAMS? Our man at the chalk face, Pete Connor, dons his mortar board and stalks the groves of Academe, cane at the ready.

57 MATHS MASTER: Colin Carruthers puts two and two together.

60 LANDSCAPES: Brian Jones opens up new vistas.

64 CBM-64 JOE AND THE ALLIGATORS: Fryin' up a mess o' catfish, goin' down to the store and buy some gingham for Emmy Lou. A peek and poke salad from F Tout.

66 BBC TANKS: Nick Sheard puts something nasty in your briar patch. An armoured division. Time to get the old Sherman out of the garage. Tanks for the memory.

71 VIC-20 TANKS: Serge Simon makes tracks for new territory. The native tanks aren't friendly. The game that took the Rom out of Rommel.

72 ZX SPECTRUM SNAKES ALIVE: A 100 percent machine-code game for any Spectrum. Kahn the snake has to collect nine eggs. 48 locations and joystick option.

78 ZX-81 SURVIVOR: Adrian Spriddell's condensed version of the ZX-81 graphic adventure game Survivor. Contains 10 of the original levels.

83 AMSTRAD JUMPER: An arcade quality game for the Amstrad CPC-64 in which you guide a little man called Jumper to the top of the screen. By Jason Charlesworth.

86 TELSOFT: This month we extend the Telsoft service to Commodore 64 owners. On Telsoft this month are Toolkit, Compiler and Space Junk.

90 ZX SPECTRUM TOOLKIT: User-friendly Dave Spagnol brings you a really useful toolkit which avoids single key entry and default values.

94 BBC COMPILER: Suitable for use on the Electron as well, describes a compiler which enables programs to run five times faster.

99 QL ZOOM: Software-based magnifying glass by Carsten Greave.

102 QL PLOTLINE: Mark Jones draws a better box.

104 CONSUMERS' GUIDE TO DATABASES: John Dawson accesses some useful sources of information on his BBC.

109 COMMODORE CBM-64 REPEAT UNTIL: M C Hart shows you how to nest loops to a theoretical limit of 22 deep.

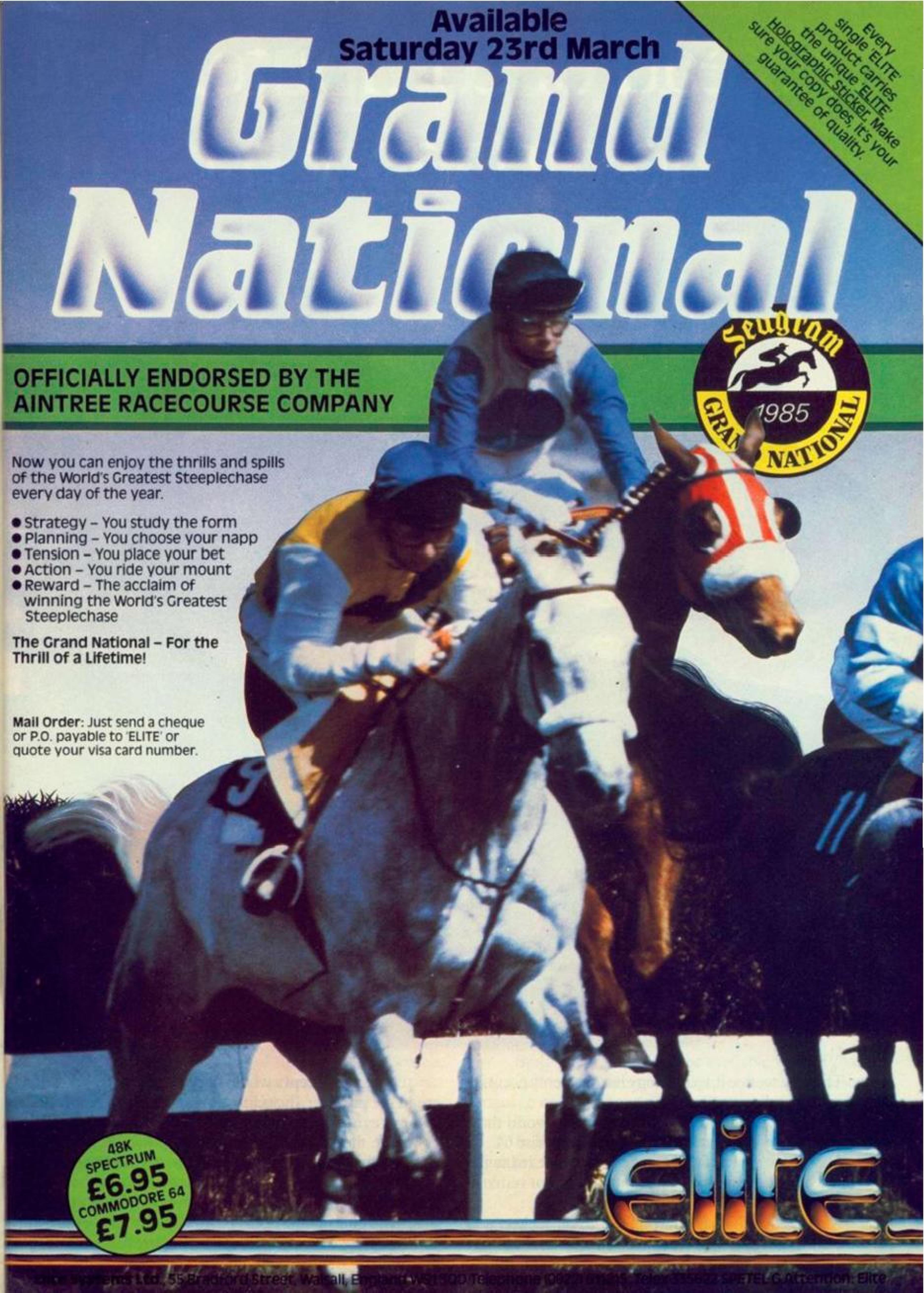
111 COMMODORE CBM-64 TRAX DISC EDITOR: Keith Suddick shows you how to avoid the trauma of your 1541 disc drive turning work into garbage.

114 CBM-64 SPACE JUNK: Nalin Sharma is lost in space.

119 RESPONSE FRAME: Tim Hartnell advises confused users.

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146 DATABASE: Paul Bond rounds up forthcoming micro events.


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Instead of computers catc[h]
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The way we see it, technology has suddenly got quite a race on its hands.

There's no other home computer in the world that's so expandable or so updatable as the new Enterprise 64.

And if you're wondering quite how we've managed that, kindly take a closer look at the outputs on our remarkable new machine.

You'll notice that amongst all the usual sockets and terminals, we've gone and incorporated a special 66-way expansion port.

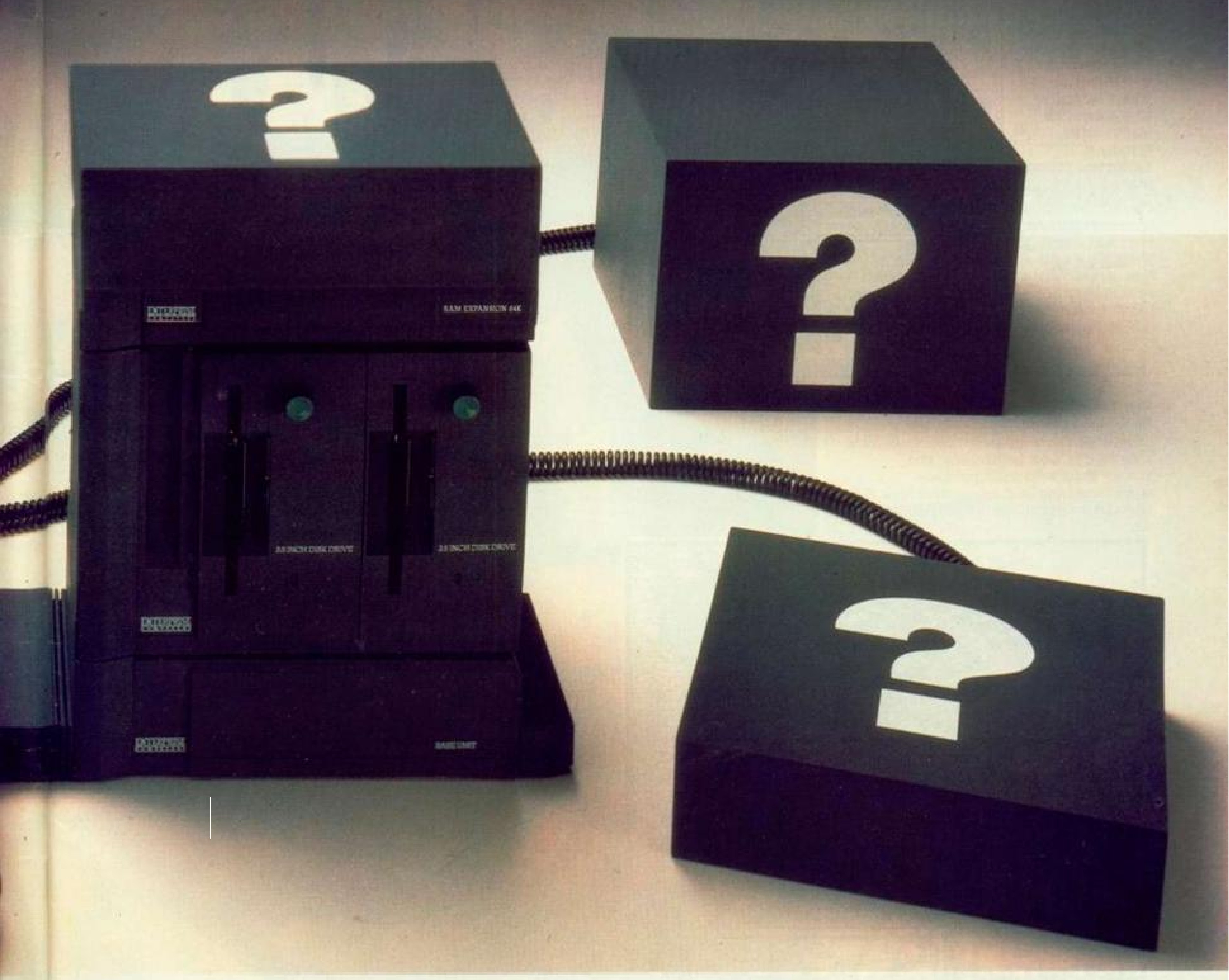
This will accept a whole range of new peripherals that are in the pipeline. Including those that are a mere twinkle in the eyes of our hardware designers.

We thought this expandability principle was such a good idea, we applied it to the Enterprise's memory, too.

Even in its most basic 64K form, this puts more user RAM at your disposal than almost any other competitor.

But plug in our special Rampacks to the base unit, and you can progressively increase that figure to a truly extraordinary 3,900K.

ching up with technology, atch up with a computer.



Not that that's the only challenge we present to today's ambitious programmers.

With a screen resolution of up to 672 x 512 pixels, 256 colours and a high speed video processor, the Enterprise will outgun all but the highest quality TV monitors.

And the sophisticated sound chip generates no fewer than 4 voices across 8 octaves in full stereo.

Combine the two and you can create effects that leave today's games looking like pub video tennis of the mid-seventies.

For anyone with literary aspirations, the Enterprise also comes complete with an integrated word processor.

Whilst the really serious user will be delighted to discover analogue RGB and TV outputs, as well as parallel, RS423 serial and network ports.

Both Cobol and 'C' will be available with CP/M running, and you can even use Lisp, Forth and Z80 assembly language on cartridge without encroaching on user RAM.

The new Enterprise 64.

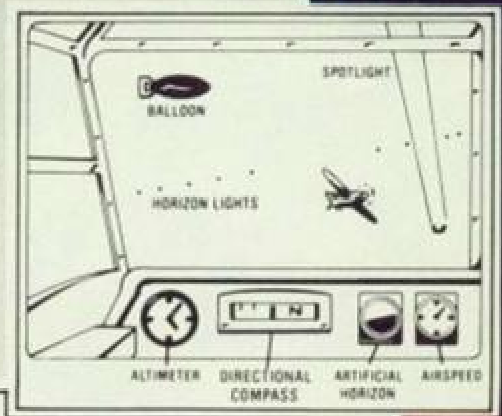
It hasn't just overtaken technology. It's left every other home computer straggling in the distance.

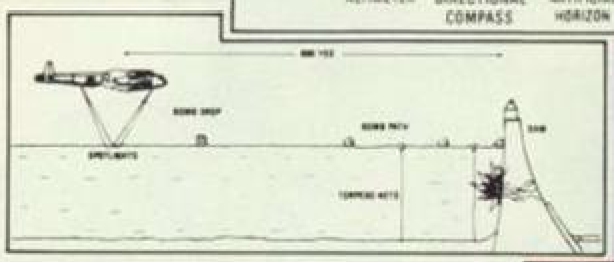
ENTERPRISE
COMPUTERS

WITH OBSOLESCENCE BUILT-OUT

At 21.15 hours on the evening of May 16th 1943 a flight of specially prepared Lancaster bombers left Scampton Airfield for Germany. After months of planning and preparation Wing Commander Guy Gibson and his 617 Squadron were at last embarking on a mission so daring that it would guarantee them a place in the annals of history.

The mission would strike at Germany's industrial heartland. If the giant dams of Moehne, Eder and Sorpe could be breached, millions of tons of water would flood the Ruhr, cutting vital water supplies to steelworks and homes, flooding factories, power stations and farmland, and





bring the important Mittelland Canal to a virtual standstill.

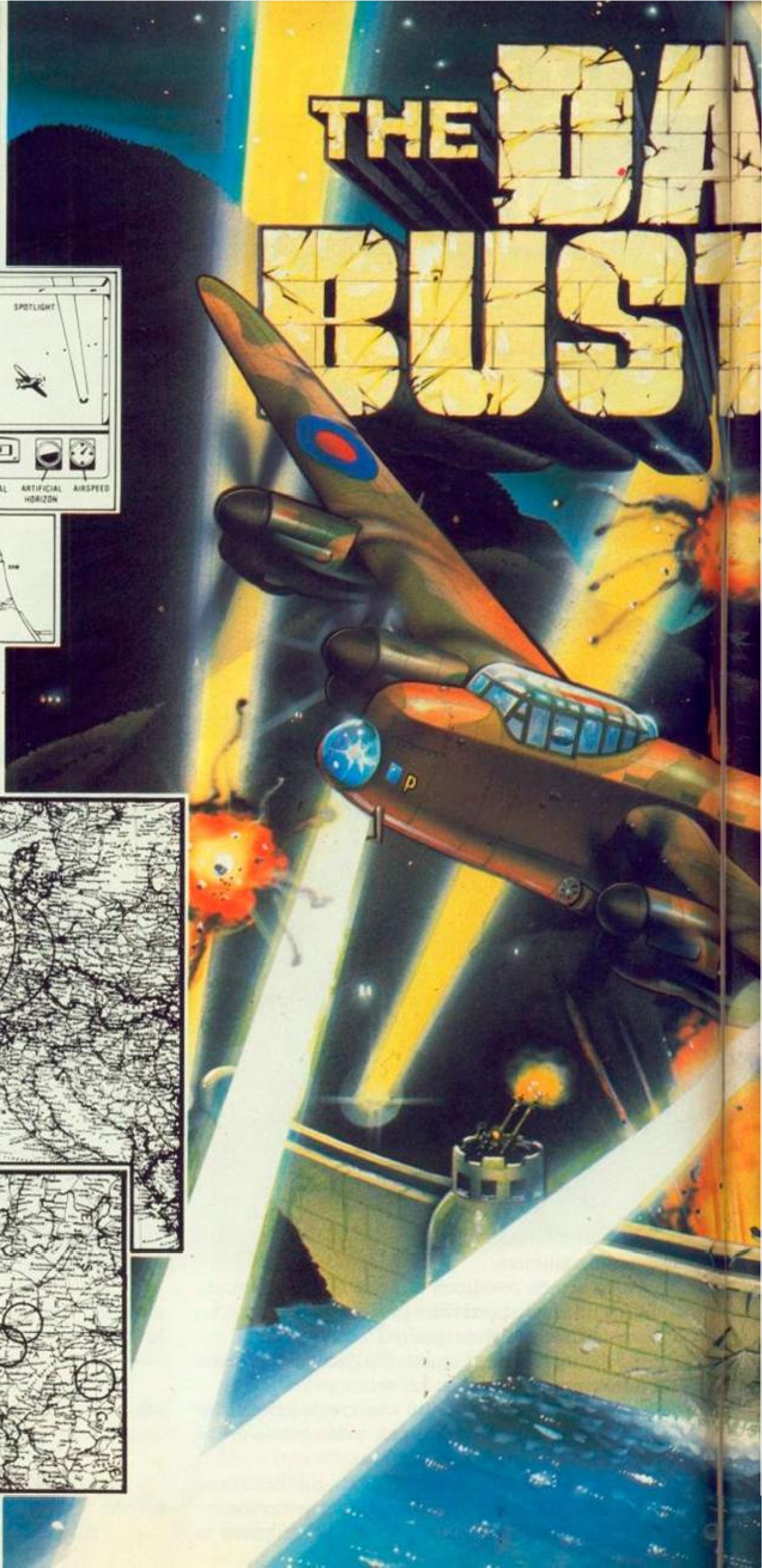
Of course the successful conclusion of this raid is now legendary, the young men who took part are acknowledged as heroes; and now U.S. Gold in conjunction with Sydney

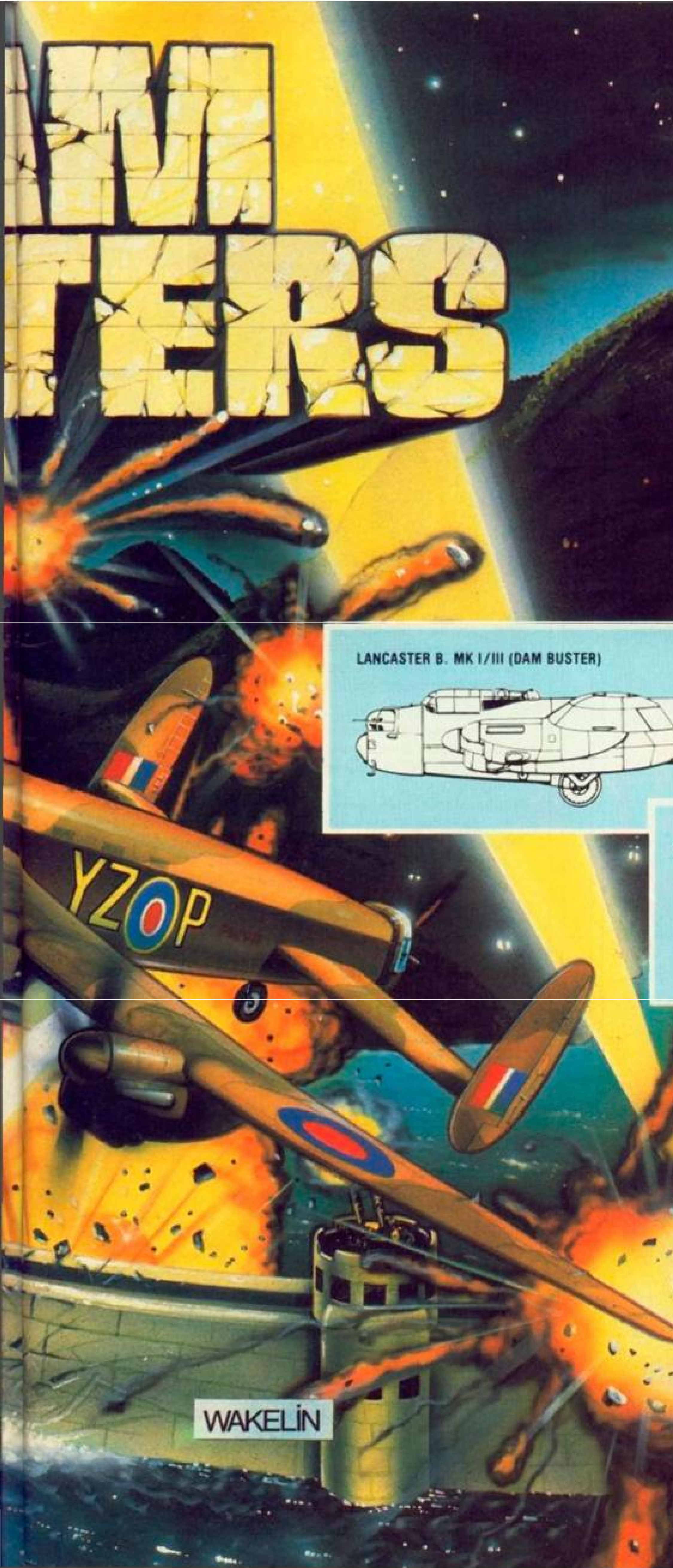




Development Corporation and the International Computer Group are giving you the opportunity to relive the excitement, tension and drama of this famous mission.

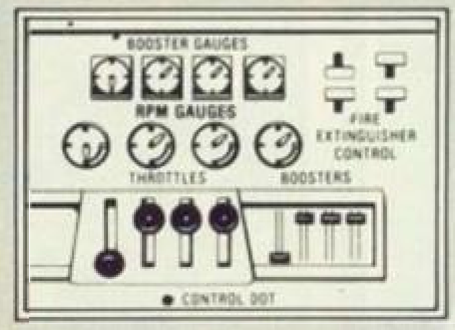
You will be able to play the part of **PILOT**, flying the Lancaster from Scampton to the target, **NAVIGATOR** using screens maps of Europe,





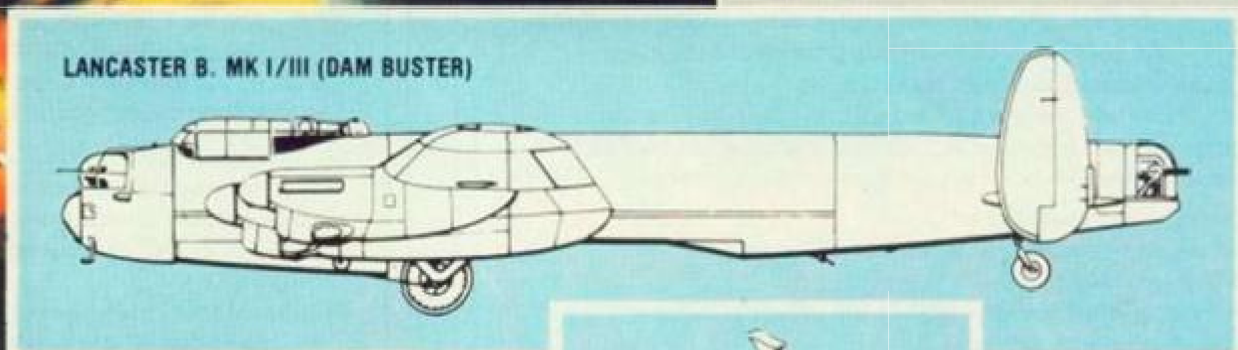
FRONT GUNNER, REAR GUNNER, BOMBARDIER and **FLIGHT ENGINEER**.

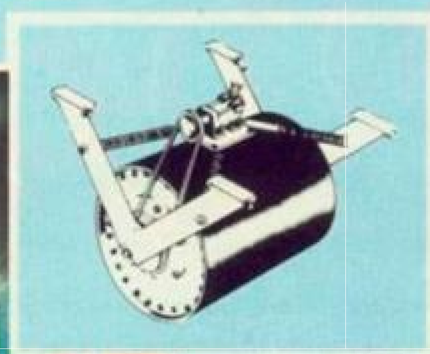
You will have to fly across Europe at low level to avoid radar; lookout for the deadly ME109 night fighters, dodge barrage balloons, spotlights and flak. At the target you will need all your nerve and skill to control the aircraft and release your deadly payload at just the right moment while avoiding enemy attack.



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Bounty Bob Strikes Back features 25 of the greatest platform screens ever produced including: Grain Elevators, Super Energy Food Bars, Gravity Lifts, Acid Rain, Suction Tubes, Hydraulic Lifts, Mobile Suction Units, Transporters, Cannons, Utility Hoists, Pulverisers, Moving Weirdos, Mutant Organisms, Treats, the greatest High Score Factory in computer history and much, much more!

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Available for: Atari and Commodore 64.
Coming soon on: Amstrad, BBC and Spectrum.

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'**Miner 2049er** emerged as the unequalled popular choice among Arkie (like Oscars) voters. Going strictly by the popular vote it would have, or come close to, copping no fewer than three 'Game of the Year' Arcade Awards.

"The Arcade Awards Judging Committee having heard the voice of the gaming nation, recommended that a new award be created this year and given to Miner 2049er. It therefore gives us great pleasure to announce the institution of the 1984 Grand Arcade Award for the Best Electronic Game of the Year.'

Editors of Electronic Games

'Last year **Miner 2049er** won a landslide victory as Electronic Game of the Year. Now this delightful multi-screen climbing and jumping game has ascended the next rung on the ladder of fame in the same high style by coasting to a triumph in the Hall of Fame voting. **Miner 2049er** has historical significance as well as intrinsic value. It was the first electronic game designed for the home market which could be played on almost every videogame and computer system. The multi-publisher licensing made Miner the first home game to acquire a hobby-wide reputation on a par with leading games found in the family amusement centres. Bounty Bob Lives.'

Electronic Games Hall of Fame

'When I saw the result – Miner 2049er – I said "Let me take it to everybody in the world." The response has been amazing. We collected the biggest advance orders ever.'

Barry Friedman – International Computer Group U.S.A.

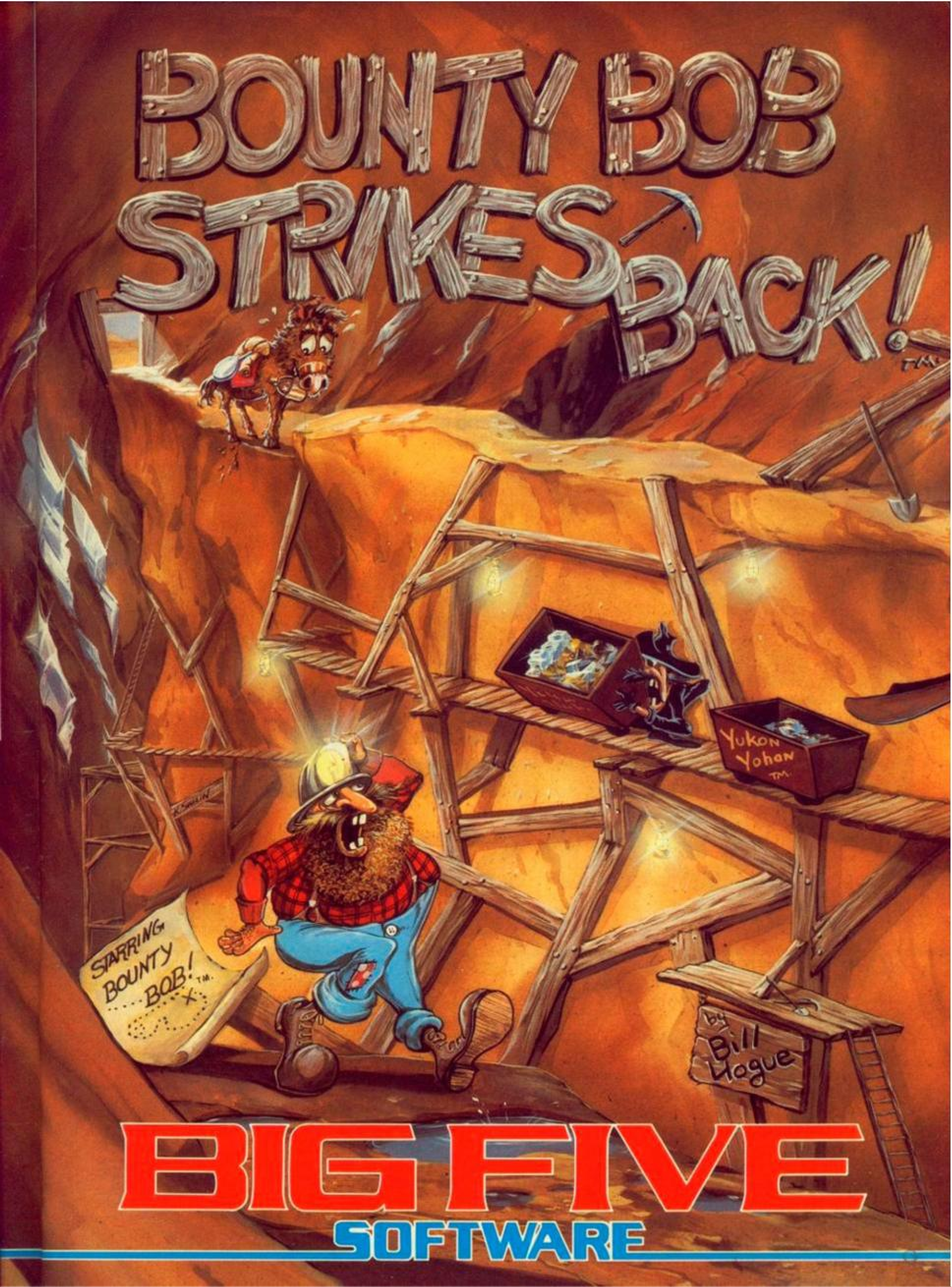
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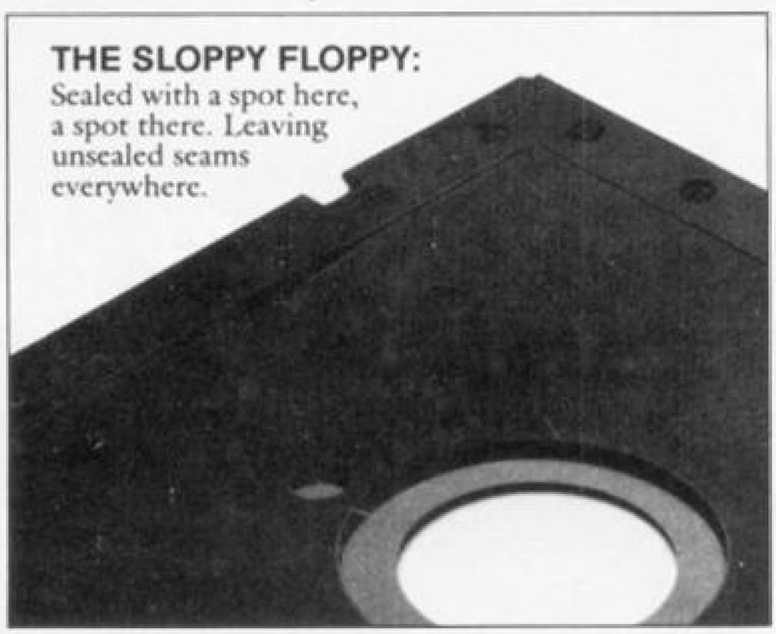
Most companies seal their discs with a spot here, a spot there. Leaving most of each seam not sealed at all.

Sooner or later, the seams might do what comes naturally: they bulge. Warp. Pucker. Open up.

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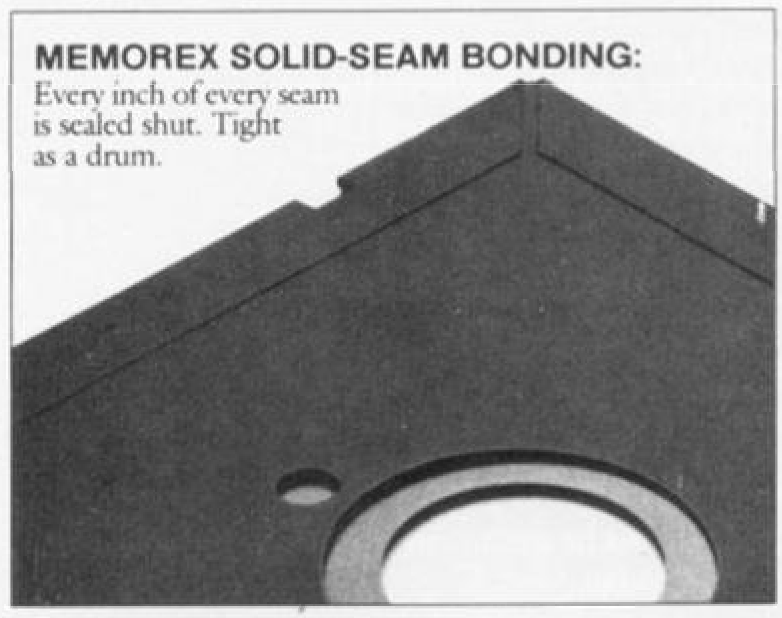
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Quasimodo likes bells. They make him feel good – they make him happy – they are his friends.
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Quasi wants the soldiers to leave him alone. They fire nasty arrows at him. Quasi doesn't want to, but Quasi will throw big rocks at the nasty soldiers.
Quasi knows a secret! Quasi knows where the jewels have been hidden in the castle and only Quasi can climb there.
They better leave Quasi alone, 'cause Quasi is getting mad. Quasi better hurry and find the jewels. Not much time. Quasi sees lots of soldiers. Quasi has lots of rocks.
Now the noise has stirred up the bats in the belfry. The bats are mean, they make Quasi fall down. Quasi better jump away from those bats.
Quasi thinks he got up on the wrong side of the bed today.
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SILICON BOBBIES FLEX THEIR KNEES

AS TV SETS BLARE out the British Telecom "It's for you-hoo" ad slogan, hackers quite clearly only get interested when it isn't.

Breaking into unauthorised pages or parts of computers is their idea of having a good time. And although these electronic trespassers might agree that what they do is wrong, they would argue that it's really only good clean fun.

Comparisons with the early, illegal days of CB radio may seem inevitable — doing something you shouldn't — but with little risk of being caught. Yet whereas citizens' band eventually became legal, there is little chance of hacking becoming so. On the contrary, recent events show that the authorities are clamping down. The arrest of two hackers in London may be a taste of what is to come.

Armed with only a home computer, modem and telephone, hackers see their hobby as a test of ingenuity: the authorities see it as a challenge to security.

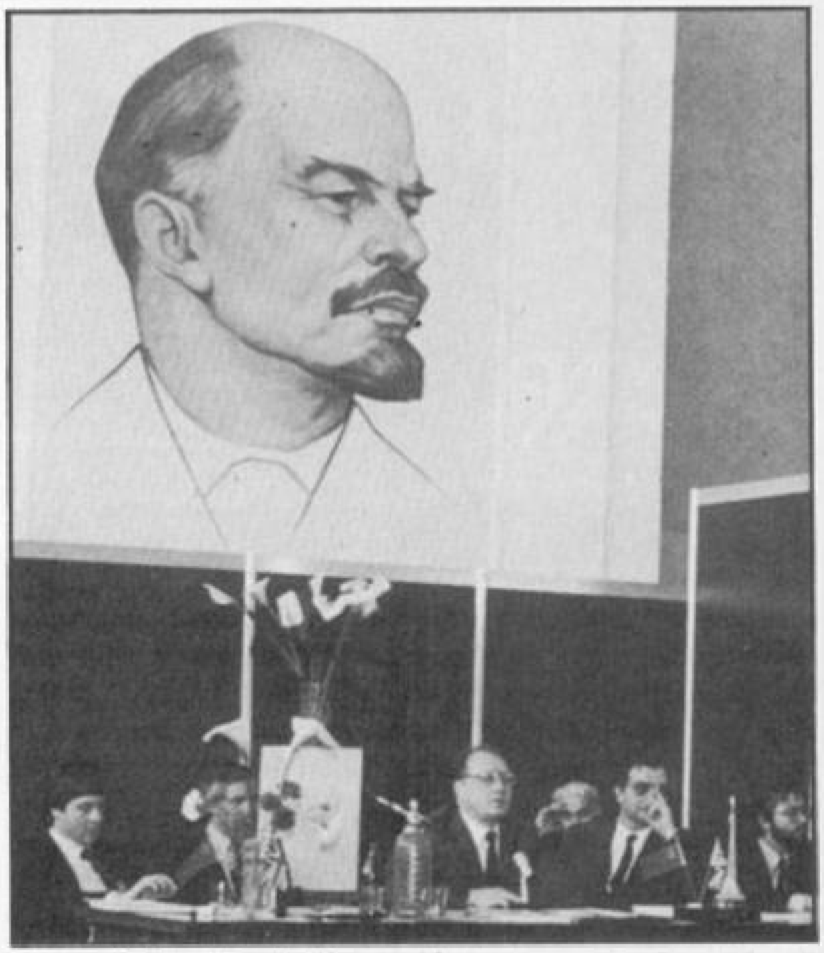
The current flood of hacking stories may be seen as bad publicity for the likes of Prestel but surely they could equally be welcomed for pointing out glaring deficiencies in system security.

After all, because networks like Prestel offer some subscribers a promise of confidentiality and are under obligation to make their system secure, it must be better that if security is to be breached it is done by people for fun rather than by vandals or criminals for financial gain.

Some claim that it is not unknown for a new network to release passwords to the hacking fraternity to test out its ability to react to breaches in safeguards. Hackers aren't interested in making use of information once they have gained access to it. They might occasionally leave a calling card by, for example, changing a letter in an unimportant word just to say they have visited.

Perhaps the recent spate of publicity surrounding hacking could actually help telecomms in general by encouraging home computer owners to buy modems. There are plenty of legitimate applications around such as *Your Computer's* Telsoft service, Prestel and Micronet 800. It seems sad that at a time when interest in modems is increasing, one of Britain's main home computer modem manufacturers, OEL, has gone into receivership. The good news is that you can still pick up one of its modems for around £40.

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Memotech negotiates in Moscow.

KREMLIN 'N CHIPS

RUSSIA needs one million micros in its schools to fulfil the next Five Year Plan and British companies are queueing up to offer their products.

Surprise front runner at the moment is Memotech backed by the Spectrum Group USSR Consortium headed by Dudley Langmead. Memotech has already produced a full Cyrillic keyboard and Rom for its MTX range but since Gorbachev came to power the pace has quickened and last month Langmead, together with Branton and Tupper from Memotech, met Soviet officials in Moscow.

The USSR might import the first 50,000 computers ready-built then switch to components and eventually self-production in a deal worth £100 million a year.

But Acorn and Sinclair are not out of the hunt — with Sinclair claiming that 100,000 Spectrums have already been unofficially exported to Eastern Europe.

Wrist micro

SEIKO'S new computer terminal in a wristwatch is the ultimate gimmick. Just plug it in to your Commodore 64 and it can receive 2K of data which can then be displayed over 80 "pages" of its two-line 24-character LCD display.



Ultimate gimmick

If you must use the £120 RC-1000 as a mere wristwatch you can still plug it in to your CBM-64 and use the big TV screen to set up messages which can be timed to appear at any time over the next year on your watch to remind you of birthdays and anniversaries.

TIME FOR 128K

Commodore sorts chaos



Commodore going to any lengths to dispose of surplus stock.

AMSTRAD, Enterprise and Commodore are launching their new 128K computers into the middle of a price war caused by the low Christmas sales which have left half a million lower specification machines still clogging up the warehouses.

Amstrad's CPC-664 will resemble the 464 except for the extra memory and built-in disc drive to replace the tape. Like the Commodore 128 it will be able to run CP/M programs although the CBM-128 "Shotgun" will also be CBM-64 compatible.

Its lack of compatibility with the C-16 and Plus-4 range probably means that the writing is on the wall for the two most recently introduced Commodores which are already being heavily discounted.

No wonder Commodore U.K. is recruiting an IBM executive as General Manager to try to sort things out.

BODY SYSTEMS AS ENTERTAINMENT

"THE THING about computers is that they lack intentionality. Essentially, they don't *want* to do anything — they're happy to follow orders." After two years' break from theatrical work, it is clear that Dr Miller is bubbling with ideas generated by study at the University of Surrey concerning artificial intelligence, and is almost more keen on discussing this than Bodyworks — the computurised follow-up to his pop-up book *The Human Body*.

Dr Miller first rose to prominence as part of the *60s* revue Beyond the Fringe which spawned such stars as Peter Cooke, Dudley Moore and playwright Alan Bennett. Apart from his work directing opera and stage plays, he more recently conducted a guided tour of the human body in BBC TV's The Body In Question.



Miller's body works

Together with the directors of the production company, Genesis, Jonathan Miller believes that there is a gap between serious business or educational software and games. Bodywork reviewed in this month's Software Shortlist is the first in a series of programs intended to fill this gap.

Genesis' future projects include a pop-up book and probably a computer game designed in co-operation with the Natural History Museum, London. And for Dr Miller? "I'd like to do a program devoted entirely to memory.

As a doctor how does he feel about the use of computers in hospitals? "Quite good in certain respects — diagnostic machines are less forgetful, but they have no intuition. Attempts to use them in psychoanalysis, as happened with Weizenbaum's Eliza program, are a reflection of the impoverishment of our lives."

How to fast load hits on a Spectrum

ALL THAT tedious messing about with assemblers is a thing of the past with the Transformer, a utility from Soft Machine, guaranteed a farm welcome from FAST — or possibly a writ.

This utility contains specific routines for copying 30 of the most recent blockbusters, including the chart-topping Alien 8 and Cycline. Adding insult to injury, it even copies them to Microdrive, leaving out such space-wasters as loading screens. So legitimate back-ups can be made of your own software!

Wafadrive speeds up CBM-64

THIRTY SECONDS to load any program on a Commodore sounds too good to be true, but that's the claim for the new £99.95 Quick Data Drive. That compares well with cassettes which take anything up to a quarter of an hour, and even the 1541 disc drive's take two minutes.

The drive, from Dean Electronics for the CBM-64 or Vic, plugs into the cassette port. Once the system is booted up by pressing Shift/Run, you have the usual Load, Save, and data storage commands. There is also a System file which gives directory, formatting and copying commands. The drive uses the same technology as the Rotronics Wafadrive.

Clive C5 on screen

WHILE gearbox problems halt production of the real C5 tricycle, Scorpio Gamesworld has cashed in with a C5 Clive Spectrum arcade game.

You have to keep picking up batteries if you want to keep going through 50 screens of hazards between the shop and your home.



What's my line?

Hacking charges against Mouse

STEVE GOLD, otherwise known as Micronet's Micromouse, and Robert Schifreen, a freelance journalist, were arrested on Wednesday night, 27th March.

The two men were taken to Holborn Police Station, where they were charged the following morning with offences under the Forgery and Counterfeiting Act 1981. A Scotland Yard spokesman said that this was "the first ever police operation in this country into the alleged use of computers to interfere with other computers". He said, "Officers from the Computer Crime Unit of the Metropolitan and City Fraud Squad in an operation in the Edgware area of London and the Crosspool area of Sheffield arrested the two men.

The raids were made in cooperation with the British Telecom officials and South Yorkshire Constabulary, under a warrant issued under section 7 of the Forgery and Counterfeit Act of 1981. They follow a three month operation into the alleged interference with the Prestel system and warnings from police that publications such as *The Hacker's Handbook* might incite people to break the law.

Century, the Handbook's publishers, has denied that either of the men charged is connected with the Handbook and the police admit that the arrests had no connection with the *Hacker's Handbook*, but they are still investigating it.

The charge the two men face is that they "forged an instrument, namely an electronic device, for recording information on the Prestel Gateway and the Kipling, Dickens and Keats Prestel computer, contrary to section 1 of the Counterfeit and Forgery Act 1981".

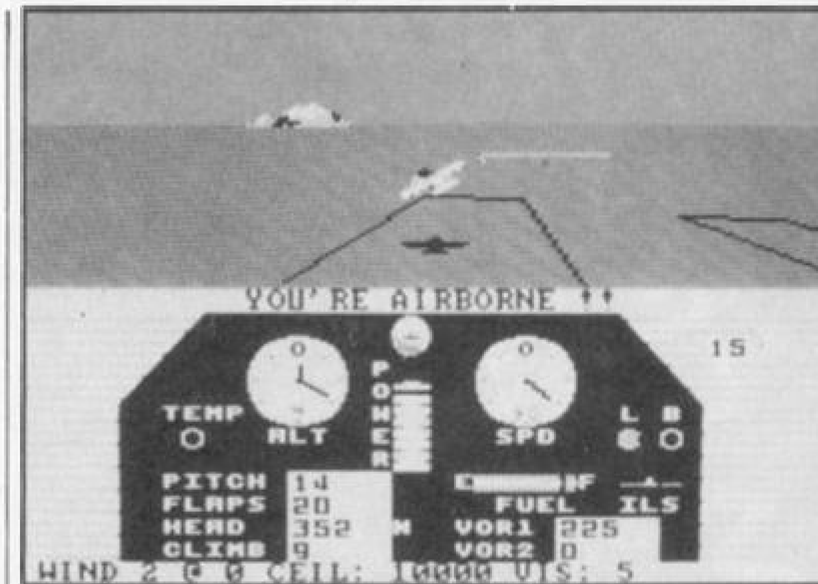
RIGHT STUFF

Pilot's Kennedy Approach

"I'M SELLING these games to men. If you haven't got the right stuff, I don't want to know." rasps Bill Stealey, president of MicroProse Software. Home of such hits as F-15 Strike Eagle, Nato Commander and Solo Flight, MicroProse programs are currently available in this country under the US Gold banner.

The next phase of ex-fighter pilot Bill's assault on the British software market via the US Gold beach-head has three main components: the Command series of Eastern Front style war games; a re-vamped version of Solo Flight and a remarkable air traffic control simulation called Kennedy Approach.

The Command series simulations allow you to play against the computer or against another player. The first two games available in the UK feature multiple scenarios ranging from single missions to in-depth campaigns. Crusade in Europe puts you in command of the Allied or German forces in Europe from D-Day to the Battle of the Bulge, and Decision in the Desert allows you to be either Monty or the Desert Fox in North Africa from 1940 to 1942. Both games have a 10-screen scrolling map, strategic maps, game save and a flashback function.



Solo Flight needed a revamp.

Air traffic controllers are one of the sectors of the American public most prone to heart attacks. You can now expose yourself to this threat in the comfort of your own home with Kennedy Approach — students of American labour relations will be disappointed to know there is no strike option in the £14.95 game. But it features excellent synthesised speech — right down to the blast of static that you always hear in the movies when the pilot replies to the tower.

US Gold plans to market the Command series at £20 — a stiff price? "I'm not interested in the kind of guy who just wants a short thrill," says Bill Stealey." If you want to spend £6 on an arcade game that you're going to play for an hour, I don't want you buying my software."

PSION EYES MARKS CARD

PSION'S ORGANISER is now helping Marks and Spencer fight Chargecard frauds quickly and conveniently.

The Organiser enables assistants to validate a card on the spot without the usual time delay in getting telephone confirmation from the central office. The Eprom datapak is loaded with the latest list of invalid cards and distributed to the stores overnight, making stolen cards virtually worthless within 24 hours of being reported lost.

Other Organiser applications include the Wessex computerised on-site building estimates system, and a prescribed drug calculator, giving a dosage, precautions to be taken and side effects of 280 commonly used drugs. Entering the symptoms produces a list of recommended drugs.



Wessex hard hat

New Gen Jonah and the wail

CLOSE YOUR eyes and you could be playing squash at the highest level — although you might miss the ball. New Generation's talking squash for the Spectrum uses a synthesised version of Jonah Barrington's voice to read out the scores.

Interface clocks on

IF YOU HAVE an Electron with a Plus 1, Cumana's new disc interface plugs straight into the cartridge port. The interface contains a battery-backed real-time clock for date stamping.

POP★ TOPS

TOP 20

	Game	Company	Machine
	1 Booty	Firebird	Sp
•	2 Everyones a Wally	Microgen	Sp
	3 Starstrike	Real Time	Sp
	4 Match Day	Ocean	Sp
•	5 Alien 8	Ultimate	Sp
	6 Ghostbusters	Activision	Sp
	7 Wild Bunch	Firebird	Sp
•	8 Monkey Magic	Solar	16
•	9 Broad Street	Argus	64
	10 Skool Daze	Microsphere	Sp
	11 Airwulf	Elite	Sp
	12 Blackbusters	Macsen	Sp
	13 Overdrive	Superior	El
	14 Technician Ted	Hewson	Sp
•	15 3D Time Trek	Anirog	16
	16 Go Go Ghost	Firebird	64
•	17 Byte Bitten	Firebird	Sp
•	18 Dukes of Hazzard	Elite	Sp
•	19 Mini Office	CDS	Sp
•	20 Bumper Bundle	Alligator	El

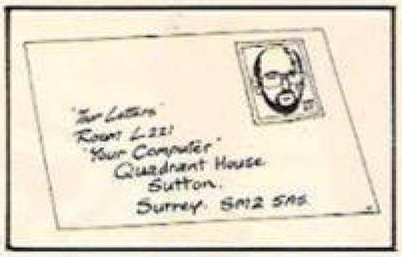
Sp = Spectrum/Bc = BBC/16 = C16
El = Electron/Vc = Vic-20
Dr = Dragon/64 = CBM 64
Am = Amstrad/Or = Oric/At = Atari
• = New release/— = Same position
Source: WH SMITH

TOP 3 BY MACHINE

		Game	Company	Machine
•	1	Vegas Jackpot	M. Tronic	Vc
—	2	Punchy	Mr Micro	Vc
—	3	Duck Shoot	M. Tronic	Vc
•	1	Mega Hits	Beau Jolly	64
•	2	Chiller	M. Tronic	64
•	3	BMX Racers	M. Tronic	64
	1	Bruce Lee	US Gold	Sp
	2	Raid over Moscow	US Gold	Sp
	3	Wizards Lair	Bubble Bus	Sp
	1	Hunchback	Ocean	Dr
	2	Manic Miner	S. Projects	Dr
	3	Dragon Chess	Oasis	Dr
—	1	Snooker	Visions	Bc
	2	Mini Office	Database Pub.	Bc
—	3	Castle Quest	Micropower	Bc
—	1	Compilation Tape 1	English	At
	2	Colossus Chess	English	At
	3	F15/Strike Eagle	Centresoft	At
—	1	Williamsburg Adv.	Microdeal	16
	2	Roller Kong	Melbourne House	16
—	3	Stellar War/ Blitz	CBM	16
	1	Classis Adventure	Melbourne House	El
—	2	Mini Office	Database	El
	3	Overdrive	Superior	El
—	1	Mutant Monty	Amsoft	Am
	2	Sorcery	Virgin	Am
—	3	Mini Office	Database	Am

Source = Websters Software

YOUR Letters



Your Computer now has its own Prestel Mailbox. Our number is 01991800. If you have any program enquiries send us a message. We will try and give you an answer within a few days.

CONGRATULATIONS

IT IS ONLY on a very few occasions can I recall seeing in your columns letters from readers who have felt compelled to tell us of retailers who have performed a "service beyond the call of duty". We are so used to reading of late deliveries, damaged goods and exaggerated descriptions that we are flabbergasted when we encounter that almost extinct species, the "caring" supplier.

It is with real pride, therefore, that I bring to the notice of *Your Computer* readers Dr. Andrew Wright of Betasoft whose software application for the 48K Spectrum, Beta Basic, adds 30 extra commands and a further 20 functions in just 11K of code.

I recently bought a Rotronics Wafadrive for my Spectrum and discovered that because of overwritten addresses the drive was not compatible with Beta Basic. I wrote to Betasoft for assistance and, to my utter amazement, almost by return of post I received a reply from Dr. Wright advising me that the necessary modification was in hand and, upon satisfactory trials, I would be sent a copy.

Now, only a few weeks later, I have up and running a Wafa-based version of Beta Basic which, incidentally, has been upgraded to take better advantage of the drive and printer output facilities.

Peter Marles,
Leeds,
West Yorkshire.

NUKE LEAR

DO YOU KNOW Nuke Lear from CCS? It's the best buy on the market! Why?

■ It costs only £2.99!

■ It is the only game that can be enjoyed by beginners and experts alike! Levels 1 and 2 are for kids, levels 3-7 are hard enough for the best shoot-'em-up champions, levels 8 and 9 will never be finished evey by the best!

■ You get a free compiler with it! Just load it by typing

```
CLEAR 39999: LOAD "W"
CODE 59900,5636
```

Then type in or load your Basic program. Type Randomise USR 60000 to compile it, Randomise USR 40000 (= start-address) to run the compiled version.

It will run 20-100 times faster than the Basic version.

H. Schneider,
Hamburg,
West Germany.

GOOD HACKERS

I READ WITH interest your first bytes feature in the April 1985 issue of *Your Computer*. May I first make it quite clear that I am in agreement with everything you say about the modern day hackers, people who seem to delight in attempting to sabotage the efforts of serious DP users.

What I do not agree with is your statement about the origin of a hacker — that is someone who spent hours locked away with a home computer. Long before the advent of home computers the hacker had risen to an almost legendary status. The hacker was the person you sent for when you needed some catastrophic software failure — usually on a PDP-11 mini — fixed yesterday.

A good hacker — and by definition there were no bad ones — had, and indeed still has, the ability to fix anything, corrupted file, application program, system software or whatever, and fix it quickly. Naturally, some of these fixes were a little crude but such was the nature of the hacker that most tended to be rather elegant repairs that tended to become accepted as part of the software.

For such a fix the term "a neat hack" was coined.

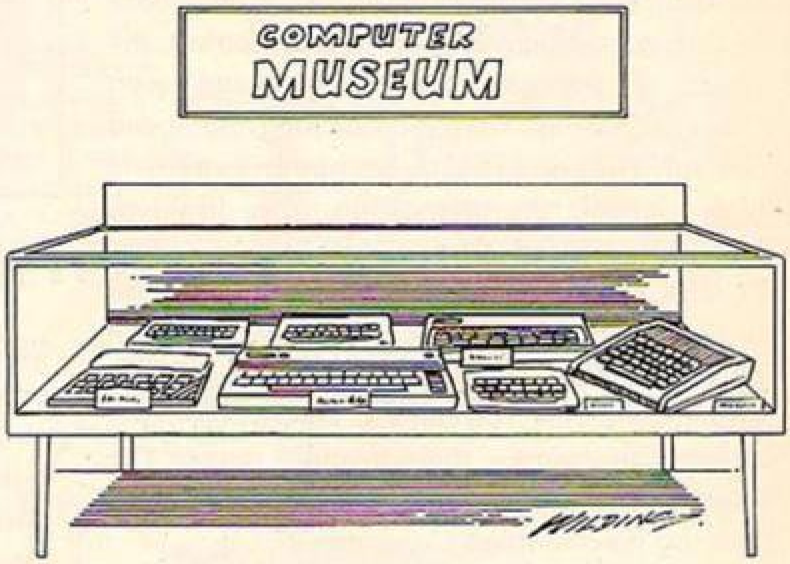
John Harper,
Roker,
Sunderland.

PRESTEL WARNING

I WISH TO issue a warning to future modem owners who are interested in subscribing to Prestel, the British Telecom Viewdata Service. The warning is *watch out, you may be in an area which cannot get Prestel at local call rate.*

(continued on page 27)

"SAVE YOUR OLD COMPUTERS"



I AM WRITING to ask your readers to think twice before throwing any old pieces of electrical equipment out, especially old calculators and computers.

The urge to collect in the human species is such that today's radios, calculators and especially computers will be tomorrow's collector's items — worth perhaps huge sums of money.

To prove my point, one only has to look at the prices old wirelesses fetch. In the days when such things were common, many people threw them away thinking that their ubiquity proved them worthless. And how wrong they were!

The reason I am making this appeal is so that posterity will be able to look at our present-day devices and marvel at their antiquity.

I am already beginning to build up a collection of old and obsolete microcomputers. They can be obtained for practically nothing, often in pristine condition.

So, think twice before you part with that old computer — it could be worth a fortune one day.

Robert Sedgwick,
Grimsby,
South Humberside.

IN ★ TOUCH

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticisms of machines and software in general. Here's how you go about getting your name into print. Your article should be typed, double-spaced, on A4 paper. A name and address on each sheet would help. Don't forget to tell us which machine it runs on. With programs please include a cassette or disc and some indication of how long it is. Please put what machine it's for on the envelope. Don't forget full instructions to us how to load and list your program and how to enter it for the readers.

The article must be submitted exclusively to *Your Computer*. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Telsoft

Telsoft is *Your Computer's* software downloading service. Any program for the Spectrum or the BBC — and soon the Commodore — which has a telephone symbol next to it is available on the service. Both 1200 and 300 baud speeds are catered for. For more details call Colchester (0206) 8068. No more lonely nights typing in endless pages of hex digits.

Message service

You can get messages to us in two ways. Either use the Prestel Telex Link to 892084 BISPRES G or you can use our very own modem, day or night on 01-661 8978. The modem is V21, 300 baud, even parity, 10 bits per character. You simply transmit in upper case "YRC" — our address code, and wait for the acceptance code "+ + + STF GO". Then off you go. Don't forget to tell us who it's for. Sign off with "NNNN" — again in upper case.

YOUR Letters

(continued from page 25)

It was only after I had subscribed that I found out that the whole country was not at Local Call Rate.

It looks as if I will have to sell my modem soon as our telephone bills are through the roof. If any other Prestel users who do not get the service at local call rate would like to contact me over Mailbox to exchange views on this, my Mailbox number is 082422531. I shall fight on.

Robert Evans,
Ruthin,
Clwyd.

SCREEN ERROR

THANK YOU for publishing my program Screen. However several errors have occured in the text which could lead to difficulty in using the program. The corrections are listed below Page 101, Column 2.

Line 16 "Pressing shift and graphics will alter the letter to an inverse G indicating that keys with graphic characters will have those as face value while the others are normal face value."
Line 28 "1 Indicates"
Line 31 "2 Will"
Line 34 "3 Then"
Line 38 "Editing of the screen may be carried out at any stage up to new-line on 3".
Page 102 Column 2.
Line 11 "PEEK x+1" (No brackets)
In addition the flash character may be altered by Poking 16772 with the code of the character required.

Mark Stenlake,
Whitwick,
Leicestershire.

CREEPY BUGS

IT HAS come to my notice that my program Creepy Castle — March — as it stands will not work on the Oric-1, only the Atmos. This is mainly due to bugs in the Oric-1's Rom but there is also a missing line from listing 1. There should be a line:

```
4525 POKE#7800, #4C:POKE
  #7803, #4C:POKE #7806,
  #4C
```

When the Oric-1 loads in a block of memory, it decides to adjust the Basic program pointers resulting usually in "out of memory" errors. To get around this problem, insert the following lines in listing 1:

```
25 DOKE1024, DEEK(#9C):
  DOKE1026, DEEK(#9A)
32 DOKE #9C, DEEK(1024): DOKE
  #9A, DEEK(1026): CLEAR
```

I believe that the Val function on the Oric-1 evaluates hex numbers — preceded by a hash — as zero resulting in the machine-code loader not working properly. This problem can be partially solved by making the following changes to listing 2:

```
10 INPUT "START ADDRESS (-1
  TO END)";A
20 IF A= -1 THEN END ELSE
  C=0
35 INPUT B
40 IF B= -1 THEN 80
50 POKE A,B,
60 A=A+1;C=C+B
```

Now -1 is entered to terminate a block instead of "S" and each number entered must be prefixed by a hash character.

Also, in the article the command for saving "castle3" should read, A6912 after "Castles" not ,A6192.

Myles Dunlop,
Totnes,
Devon.

OPEN WINDOS

THIS IS a modification to Ian Briscoe's Windos program which may be of interest to those without Microdrives — and maybe some, like me, with — who would like a VDU command to make the Windos system easier to operate. There is a bit of unused space between the program and the UDG area, and this is where this fits. Load Windos, then run the following program:

```
10 RESTORE: DATA 17, 118, 27,
   225, 167, 237, 82, 32 ,250, 213,
   223, 254, 44, 192, 231, 205,251,
   36, 253, 203, 1, 118, 40, 6, 205,
   213, 45, 215, 24, 236, 205, 54,
   32, 24, 231
20 FOR n=65282 TO 65316
30 READ a: POKE n,a
40 NEXT n
50 SAVE "WINDOS" CODE
   60000,5317
```

Following the normal setting up for Windos — i.e., Rand USR 60000: Rand USR 60003 — insert the command Let VDU=65282. Now try the following Basic line:

```
LPRINT USR VDU, 31, 22, 10, 10,
"HELLO", 5, 5, 6, 10, 5, 5
```

This is exactly the same as:

```
LPRINT CHR$ 31; CHR$ 22; CHR$
10; CHR$ 10; "HELLO"; CHR$ 5;
CHR$ 5; CHR$ 6; CHR$ 10; CHR$ 5;
CHR$ 5;
```

Dave Spagnol,
London E2.

CORRECTIONS

Statement 542 in April's QL Tutorial program was omitted. It is located at hex 458 and reads trap # 0. The hex code for this instruction is 4E40.

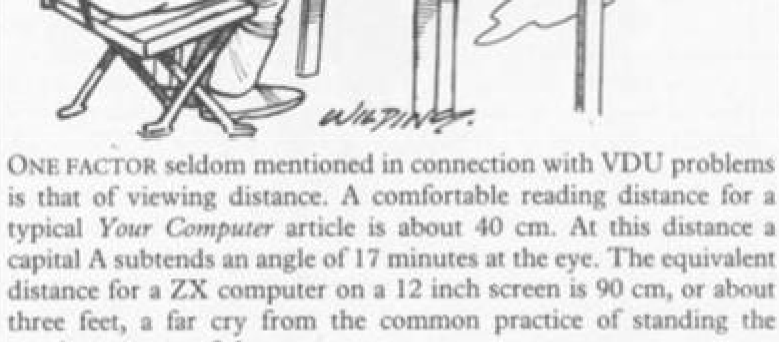
The hex loader for April's Amstrad Disassembler needs modifying before it can work. Change line 200 to read:
200 POKE address+y,a
and insert
165 y=0
205 y=y+1

The character which precedes the command for enabling the disassembler should be a bar character — shifted @ — and not an exclamation mark as suggested in the text.

The error messages printed in inverse video in lines 6000 to 6040 of April's Spectrum Singlestep program are not clearly visible.
They read, in order:
Number out of range
Not a decimal number
Not a hex number
Not a suitable flag value
Interrupts disabled

Lines 595 and 610 in the listing for April's CBM Pikchachanja are not clearly printed. They should read:
595 GOSUB 800
610 X=X1:Y=Y1:etc

EYEING UP A VDU PROBLEM



ONE FACTOR seldom mentioned in connection with VDU problems is that of viewing distance. A comfortable reading distance for a typical *Your Computer* article is about 40 cm. At this distance a capital A subtends an angle of 17 minutes at the eye. The equivalent distance for a ZX computer on a 12 inch screen is 90 cm, or about three feet, a far cry from the common practice of standing the monitor on top of the computer.

When the screen is too close flicker is exacerbated since more of the screen falls in the area of periphal vision, and also the eye can only comprehend part of the screen at any time, leading to excessive eye movement. My suggestion to those suffering from eye strain is to move the screen further away if at all possible.

Phillip Bender,
Sunderland.


THE ELECTRONICS MAGAZINE
PROFESSIONALS CAN'T RESIST.
Electronics and Wireless World is the only electronics magazine to really tempt the professionals.
It's the only one they take the trouble to pick up for themselves.
That's because it's written for the engineer who sees electronics not only as a job, but also as a hobby.
It's written on a technical level that doesn't talk down to you.
It keeps you up to date with all the latest products and processes, applications and equipment.
And it covers every industry where electronics is involved.
Just one look at the new look magazine and you'll see why it gets professionals like you out of the office, and down to the newsagents.
ELECTRONICS & Wireless World
The leading magazine for electronics engineers.

BEGINNERS

First bytes

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

I could do that...

If the few examples on page 31 stimulate you into giving some thought to making more imaginative use of loops, maybe you'd like to try your hand at this month's First Bytes competition and a chance to win our £15 prize. To enter, simply write a short routine to achieve anything you like — but make sure it incorporates no more than five loops — at least one of which should be nested.

Your program should also include a dynamnic variable linked to the increasing or decreasing value of one loop, and a counter.

Send your entry to First Bytes, Your Computer, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

P Wilby, 34 Sheldon Close, Bransholme, Hull wins March's competition to write a program that modifies itself. His routine makes program lines which start with five colons invisible when listed.

By changing the first colon to a zero byte it fools the operating system into thinking it has reached the end of a line. To make the lines visible again change the 0 in line 10050 to 58. The program runs on the Vic-20, and the Commodores 16 and 64.

Anyone interested in the subject of self-modifying code might care to look at *Scientific American's* computer recreations feature. A recent issue introduced the fascinating idea of Core Wars — battles between two or more programs in memory at the same time. The aim of each program is to gain control of all available Ram space by replicating itself and attacking the others.

```
10 :::::PRINT "THIS PROGRAM"
20 :::::PRINT "PROTECTS LINES"
30 :::::PRINT "0 TO 9999"
40 :::::PRINT "FROM"
50 :::::PRINT "PRYING EYES"
10000 A=PEEK(43)+PEEK(44)*256
10010 ADDRESS=PEEK(A)+PEEK(A+1)*
256
10020 LINE=PEEK(A+2)+PEEK(A+3)*2
56
10030 IF ADDRESS=0 THEN END
10040 IF LINE=10000 THEN END
10050 POKE A+4,0
10060 A=ADDRESS
10070 GOTO 10010
```

A bluffers' guide to micros

ADMIT IT. You're not really a computer expert. Okay, you know all about what's at the heart of every computer — a microprocessor, of course. You've probably figured out the oblique reply to the question "But what is a home computer for?" (The correct oblique reply is "What is a piece of *paper* for?").

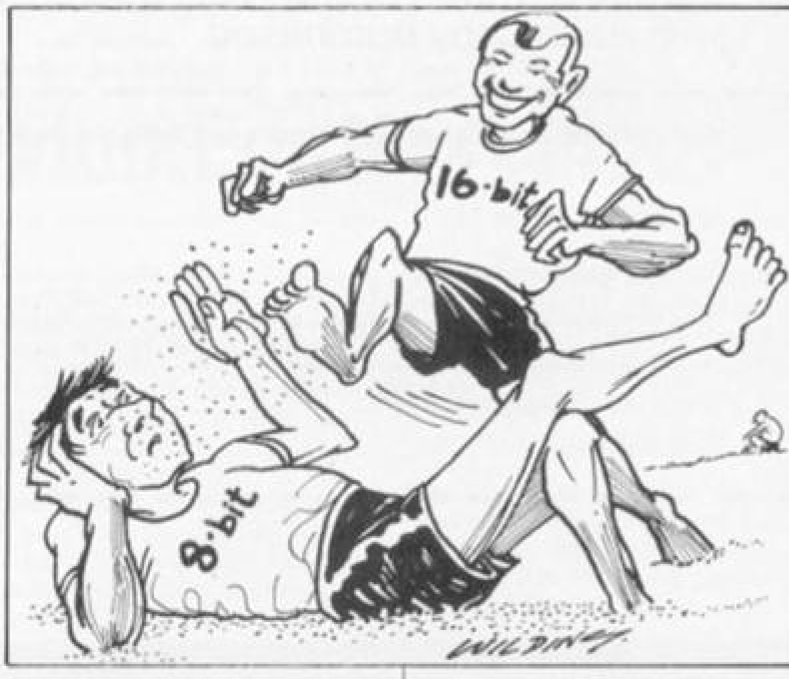
Maybe you even know enough not to get into a situation you can't handle — like trying to sing the praises of a CBM-64 to someone who owns an IBM PC. But at the end of the day there are still those bits of the conversation when names are dropped or antique machines referred to that make you feel like the man who hasn't been reading the FT. No comment.

Well, *Your Computer* is here to help you. Over the next few months we hope to develop, not just your knowledge, but more importantly, your techniques for defence. As with ju-jitsu, skilled micro-bluffing is all about turning aside remarks that threaten to expose your abysmal ignorance.

First, know your enemy. As with all social groups, there is a recognised pecking order among micro owners. A TI-99/4 owner, for example, is treated very often by the rest of the pack as a complete pariah. Why should this be? After all, as the distressed Texas owner often cries out whenever the pack starts circling him: "It is a 16-bit machine!".

Surely a 16-bit micro owner should be able to kick sand in the faces of mere eight-bit micro owners. But as we watch, we discover that for the Texas owner, at least, this is anything but the case.

The encounter is as horrifying in its way to the detached observer as watching a python swallow a lizard whole in a David Attenborough documentary. Nevertheless, it is instructive, since we are already deep in microbluff territory. What is the true meaning of the piteous cry of 16-bit, coming as it does in stark



contrast to the rhythmic tribal grunting of "Eight-bit, eight-bit"?

We all know what a bit is, of course. Defined elsewhere as "a boringly dichotomic entity which precludes rational discussion," the bit is more precisely a binary digit. Microbluffs and microbluffers alike all learned at mother's knee that each of the elements comprising the memory of any computer is a binary system — one state denotes 0, the other state denotes 1. But this cannot help our hapless Texas owner. He is the victim of two things: architecture, and history.

First, architecture. The term eight-bit normally refers to the width of the data bus as opposed to the address bus. The job of the address bus is to access addresses in Rom or Ram. The instruction that the address refers to is sent back to the CPU via the data bus. The address bus is one way. The data bus is two-way — for example the instruction the address bus got hold of might require the transferrence of further data from Rom or Ram, or even to the input/output ports (I/O in microjargon).

Most home computers like the Spectrum, BBC, Commodore 64 etc are referred to as eight-bit micros. This refers to the width of the two-way data bus. And the width of the data bus determines how much information is processed in the CPU in a standard amount of time.

Obviously a true 16-bit micro ought to be able to shove twice as much through the CPU in the same standard amount of time. Just like a six-lane highway can carry twice as much traffic as a three-laner. But — and this is crucial to the TI-99/4 — big motorways can create parking problems in the city centre. For all its 16-bit architecture, only 32K of memory could be accessed by the 9900 chip deep in the heart of ever Texas.

And instead of having just an address bus, data bus and control bus, like the 6502, 6809 or Z-80 chips found in most home micros, it had a separate communications register unit I/O bus as well. So it needed an expensive 64K pin package to keep everything moving around. And instead of carrying on-chip registers like conventional processors, it had blocks of work-space registers in Ram memory.

All it had on the chip was a program counter flag register and the register pointing to the current workspace. So basically it's weird. It had its uses as a dedicated chip in military aircraft and so on, but proved to be too expensive and too strange to be bought by people in large volumes — which chips have to be if they are to be worth making. So much for architecture. Now for

(continued on page 31)

(continued from page 29)

history.

When the Texas came out over here, you could only but it with an NTSC colour monitor, so it could set you back £1,000. (Did you know, by the way, that NTSC stands for Not The Same Colour twice?) It spent a long time at £600 in the UK, went through a peculiar phase of being sold for £200, but you could get another £50 back if you sent off a voucher, and ended its days being sold for around £80. Finally, it was withdrawn from the market.

This is a vital piece of home computer mythology, symbolising the legendary price-cuts that reward the patient. It is also a severe lesson in bad marketing. As Commodore chronicler Mike Tomczyk says of TI in his gross book *The Home Computer Wars*, "I figured that if a giant semi-conductor company that made its own chips charged that much money, they either didn't know how to control their manufacturing costs or were gouging profits at the consumer's expense."

So, to summarise, what the pack is conveying to its victim is basically this: "You are a sucker. You bought something that turned out to be slightly less successful step in evolution that Neanderthal man. Worse, you (a) paid a hell of a lot of money for it, (b) bought it for next to nothing off a scrapheap, (c) were given it for Christmas by a loveable but eccentric uncle who thinks that Prestel is a Jewish delicacy".

The pack is demonstrating its irrational but natural fear of the alien. Nearly all of them are 6502 or Z-80 based. There may be a few Dragon owners who are glad it is not their turn to be picked on. There is little the victim can do to defend himself. "To the initiated, the 9900 chip is powerful and flexible," he may call out — this is a strange mantra he has gleaned from an old copy of *Practical Computing*.

He can point out that the mutant communications register unit I/O bus can address up to 4,096 individual bit I/O lines. But he is clutching at straws — the unique TI speech synthesiser add-on has addressed him more often than he has used the computer to address anything else.

He must divert the attention of the pack. As the baying raises to its peak, he plays his trump card. He yells, "Well, I know for a fact that George over there has got a COMX-35 at home!" and runs like hell.

Paul Bond

BEGINNERS first bytes

Elegant programming: using For/Next loops

Elegant programming doesn't necessarily mean sitting at your micro wearing a pink carnation and spats — especially if you're female. It's more a question of rethinking those bad old hacking habits you've picked up, so that your self-written Basic routines don't look to others as though you found them at the bottom of a cardboard box.

Take as an example the ubiquitous For/Next loop. It's one of the most powerful Basic commands there is — and probably also the most abused. Check through your own uses of it and you'll doubtless find that you have in all innocence introduced a couple of classic chip-charring catastrophes.

For/Next loops are versatile; use one as a counter set to the number of times you want a particular operation to be executed, to mimic a clock, or to stuff your arrays full of data. They'll always work much better, though, if you observe a couple of golden rules.

First, don't skimp on labelling, especially if you're nesting — that is, introducing one loop or more inside another loop. This is sloppy:

```
10 FOR L = 1 to 10
20 PRINT L
30 FOR D = 1 TO 350
40 NEXT:NEXT
```

Now the proper order of execution might be clear in this simple example — but such routines aren't always so easy to decipher when you're checking over a listing of a program you wrote months before. So why not make the last line

```
40 NEXT D NEXT L
```

and remove all risk of confusion?

Next, it's wise always to close down a loop when you're finished with it, like this:

```
10 FOR L = 1 TO 10
20 IF L = 7 THEN PRINT
   "SEVEN":L = 10:GOTO 40
30 NEXT L
40 REM PROGRAM CONTINUES
```

There is an exception. You may sometimes want to use the "exhausted' value of L in a subsequent statement. If so, remember that it will usually total one more than the specified value. For example, if you Run the first demo again and then enter Print L in direct mode, you'll find the number printed in response is 11.

Of course, you can also weave in the changing loop value as a dynamic variable in a routine:

```
10 FOR L = 1 TO 10
20 PRINT "*";
30 FOR D = 1 TO (500*L)
40 NEXT D:NEXT L
```

A loop can also be used to create a simple timer. Most micros have a real-time clock held in a reserved string — such as TI$ — but you may want to keep this by for another part of your program. So use a loop instead:

```
10 FOR CD = 10 TO 1 STEP -1
20 PRINT "COUNTDOWN" CD
30 FOR D = 1 TO 350
40 NEXT D:NEXT CD
```

You're probably familiar with the technique for filling one array or more using a For/Next loop equal to the total number of elements involved. However, don't forget that you can nearly always bypass an array provided there are 10 elements or less. Try this:

```
10 FOR L = 1 TO 5
20 READ D$
30 PRINT D$
40 IF D$ = "ORANGES" THEN 60
50 NEXT L
60 PRINT "YOU'RE OUT OF
FRUIT!"
70 END
80 DATA GRAPES, BANANAS,
   LEMONS, PINEAPPLES,
   ORANGES
```

Finally, don't overlook the power that a For/Next loop can bring to all kinds of string-sorting chores. For example, some Basics — such as Commodore's — don't have an equivalent to the INSTR function available on the BBC which searches a string for a specified group of characters and returns its location. But this very useful facility can be emulated:

```
10 A$ = "YOUR COMPUTER"
20 B$ = "PUT"
30 FOR L = 1 TO LEN(A$S)
40 IF MID$(A$,L,LEN(B$)) =
   B$ THEN GOTO 70
50 IF L>LEN(A$) THE PRINT
   "NO MATCH FOUND":GOTO 90
60 NEXT L
70 PRINT "POSITIVE MATCH
FOUND"
80 PRINT "BEGINNING AT
   CHARACTER" L
90 END
```

After trying this version change B$ to "OUR" and Run the program again; next, make B$ = "NIL".

John Ransley

The flexible floppy disc system

Although cassette tape is a perfectly adequate medium for those people who just want to dabble with computers, most serious users find it too hampering for real computing. It is awkward for handling program files and downright obstructive for manipulating data files of more than a handful of records. The remedy most sufferers of data headaches turn to is the floppy disc.

Discs — Americans call them disks or diskettes — are flat, round platters of magnetic material encased in a plastic shell. They come in a variety of sizes; eight inch, five and a quarter inch, three and a half inch, and three inch. There are also a number of different formats, densities and single or double sidedness.

In order to use discs with a micro you need three elements; a disc drive, an interface and some controlling software. Normally, a disc drive will be sold with all three components included in the asking price, however that is not always the case. Most manufacturers market a disc package designed to work with their computer.

The notable exception to this rule is Sinclair Research, who has decided to plough a lonely furrow with the Microdrive. Yet Sinclair owners who desire the flexibility and convenience of floppy discs can turn to the third party disc manufacturers who also market units for other ranges of micros.

When buying a disc unit, it is worth taking a look at the "official" unit for your system first. This is usually the same as the most popular drive and is important because any disc-based software produced for your system is likely to be available in this format. Before purchasing, check that the drive you intend to buy is supported by the software houses.

You will almost certainly want to transfer your library of software to your disc drive. This should be a trivial task as far as converting your own Basic programs is concerned but may be much more difficult for commercial software.

Depending on a number of factors, you should expect to part with around £200 for a single disc drive. A twin drive unit will often cost less than the sum of two singles as the power supply, controller and interface will be shared.

Remember that eight inch discs are a dying breed. Five and a quarter inch discs are still popular, though the drives can be more expensive to buy. Microfloppies — that is the Japanese three and three and a quarter inch discs — are becoming more and more popular all the time; however the discs are expensive to buy costing around £5 each.

Apart from the hardware, you will also be faced with a choice of operating systems. If there is a system specific to your micro, such as Commodore Dos or AMSDOS, you will have little choice. CP/M is a standardised operating system which will open your machine up to a wide range of software.

Bill Bennett

If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Memotech

Memotech owners now have a magazine devoted just to them. It has articles on the machine, programs to type in and offers on commercial software. Contact the Memotech Owners Club, 23 Denmead Road, Harefield, Southampton..

Christian

A club has been formed "to promote the use of microcomputers in Church related activities". Christian computer users should contact the Secretary, P.A. Clark at the Christian Micro Users Association, 6 Wakely Street, Sheffield, S6 3RG.

Atari

Atari owners in the Watford area might like to join this likely bunch of WAG's (Watford Atari Group). Yet another offshot of the ever prolific Infomania group, they plan to cover a wide range of Atari related activities. WAG promise a software library and newsletter as well as regular meetings at Infomania HQ. Membership is £15 per year. Interested Atarists should contact Chris Bone (Garston 672235), or write to him for more details at 10 Garston Drive, Garston, Watford Herts WD2 6LB.

Elbug

The publishers of BEEBUG for the BBC have produced a cut-down offshoot for a cut down computer, the Electron. For £9.90 you get 10 issues of ELBUG, and the club provides other facilities such as local user groups, a discount scheme with a number of retailers and a software library. It's available from ELBUG, PO Box 109, High Wycombe, Bucks HP11 2TD.

COMPUTER club

Patrick McDermott takes the high road to Glasgow and discovers omnibuses as well as databuses at the S.P.T.E. club.

THERE ARE five, perhaps six, computer clubs around Glasgow. There might be over 100. The difficulty in knowing arises from the fact that they do not make themselves known, particularly to each other. By far the largest and best known is the S.P.T.E. Club organised by John Reid.

When I visited the club for one of the Sunday evening sessions, John was putting on a performance like one of the stall-holders at the famous Glasgow "Barras" market. With a CBM-64, disc drive and monitor, he enthusiastically demonstrated the wonders of computer programming to a gathering of 30 or 40. Not that it seemed necessary to sell them the idea, most listened attentively and stopped him in full flow if he had gone on too quickly.

Elsewhere in the large room, four or five small groups were working on their own, maybe they were playing games; but if they were, then they were silent ones, for games playing is not encouraged until the final hour of each meeting.

The tutorial that was taking place was the easy part of what is a very impressive programming course that forms the main part of the club's activity. This was the second of 12 fortnightly meetings that begin by assuming that the participants have no previous knowledge and end 24 weeks, three test papers and a programming project later.

On completion each member will have a full working knowledge of Basic and a complete set of detailed course notes and exercises for future reference. The course is not as stern as it may sound; the test papers indicate to John and his assistants where extra emphasis is required or if any private tuition is necessary. Just now courses in Sinclair and Commodore Basics are run with an Amstrad course a possibility for the future.

If the whole business seems more like hard work than fun, then that is far from the truth. The membership of 192 is made up mostly from Strathclyde Passenger Transport Executive — S.P.T.E. bus crews and their families, although anyone can join, children with their parents approval only. The meetings take place in the staff function suite at one of the depots, a venue that comfortably provides all the necessary facilities and allows the nightly fee to be kept to 20p for adults and 10p for children.

As with most public computer clubs, there is a span of age groups and while I saw no-one under ten or over fifty, there was a variety of all inbetween working together. Unlike a lot of clubs there was a reasonable representation of female members.

I was surprised to see that there were relatively few computers at the club. Not, I found out, because members didn't have one; but that the organisers preferred people to work together. The theory seemed to work. Spread around the room there were people working on databases, music programs, writing adventure games, helping each other come to terms with machine code as well as Basic. A variety of machines were in use; Commodore 64s, 16s, Vic-20s, BBCs, Amstrads and Spectrums. There were also a variety of monitors, VVS, disc drives and cassettes that seemed freely available.

When younger members found that their joysticks were going down faster than Mary Decker when they played Daley Thomson's Decathlon, John Reid designed and built a more durable customed joystick from the broken one and some extra parts. For more serious breakdowns of computers or peripheries, members can have repairs made via the club which has an arrangement with a local workshop.

Arrangements with other businesses provide discount discettes, discounted software and Activision, and has enabled the club to form its own library. A local book distributor allows the club to review books and then to purchase their choices at a discount. Businesses benefit from greater trade and the club by being able to offer more facilities to its members. Other businesses seeking similar benefits would be made most welcome.

Travelling has never presented any problem to the S.P.T.E. computer club. Free busses are one of the perks of the job and there is no shortage of drivers, a facility that the club intend to make the most of. A full list of outings to computer shows, commercial installations, and some of the computer manufacturers that abound in the area is planned. It is a facility that the club is willing to share with any other local club who dares make themselves known. Other clubs could benefit from both the visits and opportunity to witness an active, well organised and resourceful club at close hand.

The S.P.T.E. Club will welcome any inquiries from business or prospective members and details can be had from the organiser: John Reid, 3 Meadow Road, Partick, Glasgow.



COMCON

Programmable Joystick Interface for the Spectrum

£19.95



Extension port for Curnah Micro [sic?] speech unit. Combine joystick with sound and speech for ultimate arcade action.

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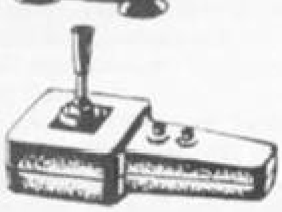
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Interface

HARDWARE hitlist

ADD-ON EXTRA

XK Spectrum

Spectrum 48K
Television Services
£20.95

The XK is available as a kit add-on or fitted to your Spectrum for £5 extra.

What it does is hack the Spectrum's memory up into two 32K pages. It also allows you to add up to 128 external pages, each up to 32K, onto your machine.

Each page of Ram can have a program running in it, and have a separate screen window dedicated to messages generated by that program.

One major problem is that most of the more complex games such as Alien 8 and Lords of Midnight won't run on an XK Spectrum, and being a soldered-in modification, you can't quickly change back.

Maxam

Amstrad CPC-464
Arnor Ltd.
£59.90

Arnor have come to the serious CPC-464 owner's aid with a comprehensive piece of hardware containing an assembler/disassembler/editor.

The small board plugs into the Amstrad so that most of the circuit board disappears inside the computer under the existing PCB. It provides an expansion bus extension and a slot for further Rom boards. You also get a 50-page manual which explains the use of the Rom-based assembler and the commands available.

Calling the assembler is done from Basic using extended commands.

Arithmetic operators and labels are supported and parameters can be passed from Basic to the code and back.

The RST command is mentioned only rather briefly in the provisional manual provided. As this controls breakpoints. This could have done with more explanation and examples. Aside from this rather minor quibble, this looks like a product no serious Amstrad user can afford to be without.

Quick Disk

- *Various*
- *Disc drive*
- *Triton*
- *£129*

THE QUICK Disk is designed as a cheap alternative to floppy disc drives, with only a slight reduction in performance.

There are three versions, Spectrum, Commodore 64 and MSX available, each priced at £129 with 100K 3in discs available at £1.99. The hardware consists of the disc drive and an interface box which plugs into the rear expansion socket of the computer. The performance of the drives is only marginally slower than normal disc drives.

A file takes a minimum of one sector and there are 20 by 2558 byte sectors per side, providing a maximum of 20 files/programs per side. Data files may be transferred between the three types of computers using the discs.

The drive repositions itself at its start position after every operation; this adds a further three to four seconds before the next disc access can be made, but does leave the head out of harms way and the data safe.

The quick disks overall are slightly quicker than the Spectrum Microdrives and appear to be reliable. Command format is simpler than Microdrive, but only just. As the quick disk built in software does not take up any additional space in memory, most software can be converted to run on the quick disk very easily using the conversion program provided in the manual.

There are a few problems with the Spectrum version — the only printer that can plug in directly is the obsolete ZX Printer, the Alphacom 32 does not work from the rear of interface. Interface 1 cannot be connected which loses the RS-232 port and modem facilities although a standard Centronics adaptor does work.

The MSX and Commodore versions do not have to sell against competitively priced products and appear to be good value for money, the Spectrum version needs tidying up to produce a viable alternative to Microdrives and stringy floppies.



Triton Quick Disk.

QCOM

- *QL*
- *Communications*
- *OEL*
- *£200*

BLOODIED BUT unbowed by the demise of Prism and Oric, OEL once again sally forth into the world of microcommunications. Once again they have teamed up with Scicon to produce a formidable product for a Sinclair machine. The hardware consists of three units: QCON, QCALL and QMOD. All three units come in QL livery and styling and stack one upon the other.

The unfortunately named QCON is the guts of the system. It plugs into serial Interface 2. It uses the TI 7000 single chip micro and controls protocols, baud rates, receiving and sending data. This can be plugged into a standard modem with an RS-232 interface, or another QCON on another QL to provide short-distance communications.

This, bought separately, would cost you £75.95 and comes with all the Scicon software. QMOD is an autodial, autoanswer unit which, at £79.95, might seem an expensive luxury to the hobbiest, but will make a big impact with the business user.

QCALL is a standard OEL V21 modem at a standard OEL price of £49.95. The hardware is only half the story. What makes this product worth a second look is the software. You get some idea when they tell you they only have room for one Prestel frame at a time in memory, the rest is filled up by the software!

The computer can be used as either a Viewdata terminal or as a VT100 terminal emulator, even down to simulating the numeric keypad. These models can either be accessed via a series of menus or the confident can just use command words.

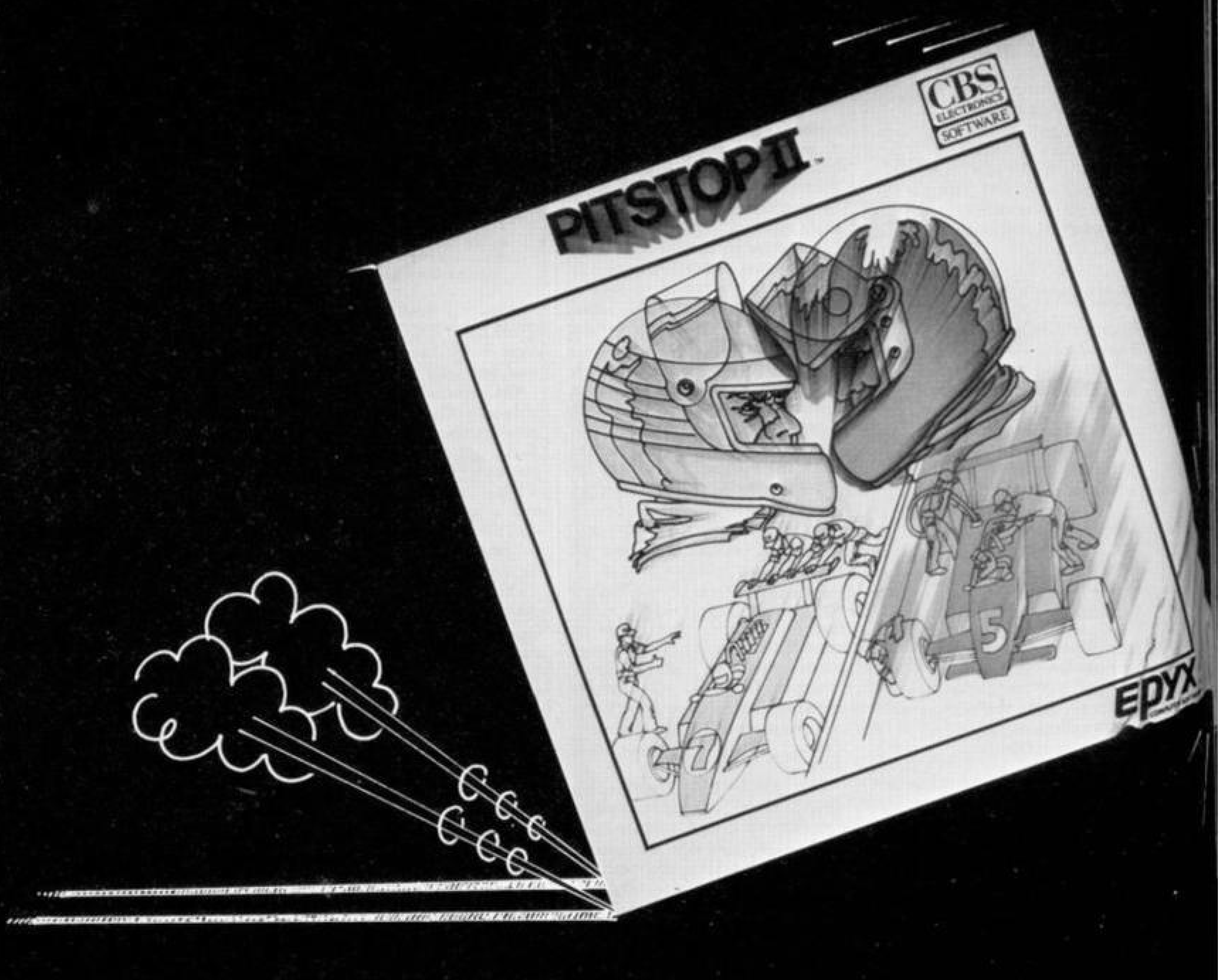
Using Prestel is simple in as far as using Prestel is ever simple. The # and * commands use the Enter and / keys. While on line, frames can be saved, loaded, printed either in text only — i.e., fast — or a full graphics screendump with shading is available which takes a few minutes. The phone book you load on booting the software can contain up to 50 named pages. Each entry on a page is given its own number and prompt string, so once you're through, logging-on is automatic.

The filing commands, again available when on line are very comprehensive, indeed they represent a major improvement on QDOS, with the sort of facilities you would associate with a proper DFS. Data on Microdrive can be encrypted and, if necessary, this encrypted version can be transmitted, with the encryption code sent by some other means.

A command sequence can also be saved on Microdrive. This allows the user to, for instance, write a message for a Telecom Gold mailbox, run his mailbox program and then walk away and let the computer get on with it, even using delayed send to send it while he's asleep!

User-to-User comms works very smoothly. Although 1200 half duplex, time sharing between both ends means it appears full duplex. Both message and file transfer is possible, with checksums sent and echoed in the latter case. Of course, this unique protocol means a QCOM user won't be able to talk to anyone else, even should they wish to converse with such mere mortals in the Spectrum and BBC world.

For the business user, the simple menus and the ruggedness of the software won't leave him with a crashed program and a big phone bill. The hobbiest will revel in the numerous clever facilities, and it might even find a market as a cheap alternative to buying a VT100 terminal for mainframe users.


CBS
ELECTRONICS
SOFTWARE
PITSTOP II
EPYX

Star★chart

KEY

★★★★★ Best of its type
★★★★ Very good
★★★ Good
★★ Average
★ Below par

Moon Cresta

ZX Spectrum
£6.95
Shoot'em-up
Incentive

★ ★ ★

The Nichibitsu arcade classic, with an opportunity to win your own dedicated Moon Cresta machine. You blast away and score bonus points by docking successfully with the mother ship.

Stay Kool

ZX Spectrum
£6.95
Arcade adventure
Bug-Byte

★ ★

Everyone raved about Manic Miner but what Bug-Byte seem to have forgotten is you must put some oomph into the graphics if you want to get away with this sort of thing. Silly jokes about police boxes and doctors are not enough.

Caveman Capers

BBC Micro
£7.95
Moon buggy derivative
Icon

★ ★

Nice to see some games for the BBC Micro after all this time. Your caveman rides on the back of a perambulating platypus. You must jump holes in the ground but avoid doing this when a low-flying bird is around.

Pole Position

CBM 64
£9.95
Road Race
US Gold

★ ★ ★ ★

The archetypal road-race game for your 64. It's all here, practice round, qualifying round, racing against other vehicles. Only carp is the under-use of CBM-64 sound facilities.

SOFTWARE Shortlist

Formula One

■ *ZX Spectrum*
■ *Management game*
■ *CRL*
■ *£7.95*

★ ★ ★ ★

FOOTBALL MANAGER with racing cars. Fabri, De Angelis, De Cesaris, Piquet — you can hire them all provided they haven't already been bought up by your Spectrum. You can load up previous games, enabling you to continue a tournament over a long period of time, you can use a Kempston joystick and from one to six people can play at a time. There are five levels of play depending on whether you are a novice, junior, average, good or expert manager.

The six teams the players can manage include Brabham, Ferrari, Lotus, Williams, McLaren and Renault. You can also choose to be a driver — the ability to add new games in is a good one: stops the game getting out of date. After this you can select a sponsor, Saudia or Denim or whatever.

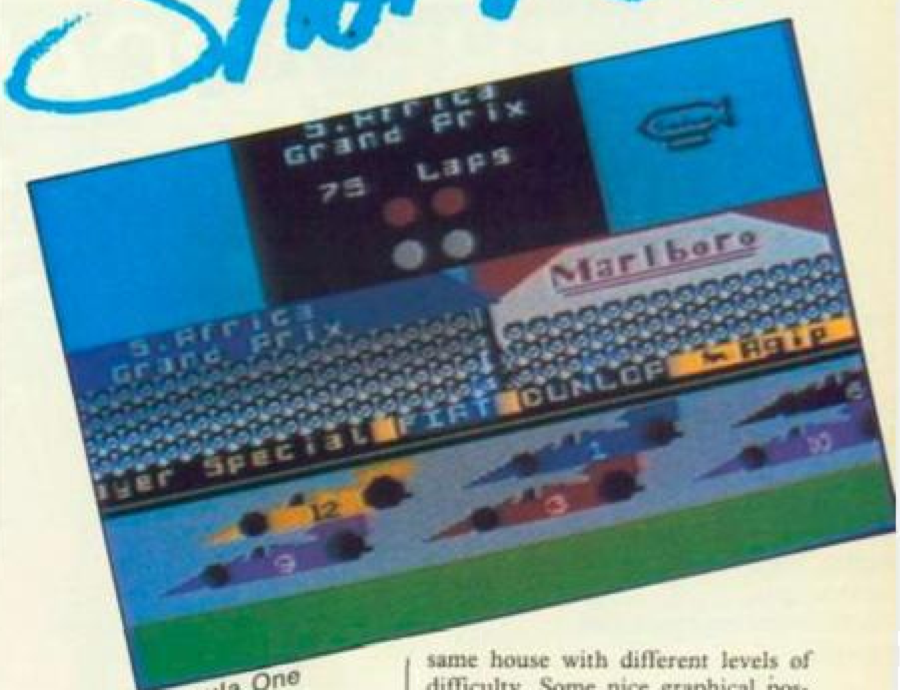
Now down to the nitty gritty — choosing your driver and then out-fitting the car. Allotted a sum — depending on your sponsors — usually around £630,000, you can improve the driver, chassis, engine and pit crew. The more money you spend on your pit crew the faster they move in the pits. This is crucial, because although the race itself is randomly generated by the micro in the style of Addictive Games' Football Manager, you control tyre changes and adjustments by steering your man around the screen.

The graphics are functional rather than brilliant — but the heads of the crowd turn to watch the cars and the Goodyear airship moves majestically across the screen. After the race you are shown who won and how they're doing in the championship stakes. Other interactive elements of the game include deciding what sort of tyres to use, dependent on weather conditions, and when to go into the pits. Simple, enjoyable, no doubt socially divisive with six people fighting to get at the controls of one Spectrum.

Paul Bond



Sam Stoat Safebreaker



Formula One

Sam Stoat Safebreaker

■ *Spectrum 48K*
■ *Arcade adventure*
■ *Gremlin Graphics*
■ *£6.95*

★ ★ ★

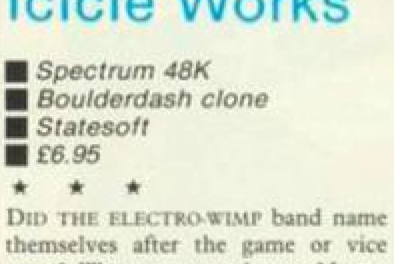
THE LATEST character to emerge from the warren of the Gremlin Gang, Sam Stoat would appear to be as guilty as Monty was innocent. Intent on stealing a very valuable diamond he braves bouncing bed-springs, runaway pool balls, nasty green bottles, pogo gnomes and deadly gnomemobiles in his quest.

Rather like Statesoft's Icicle Works, you get four main scenarios to choose from. Sam prowls about in the dark below four houses ranging from easy to hard. Press the fire button and pop goes the stoat — you're in the house of your choice.

The basic scheme of the game is to locate the explosive bomb and match — then you can blow the safe. Having grabbed the diamond and whatever other jewellery may be lying around in the house, you can then move on. Each house contains 20 screens including the vital bottle of stoat elixir that boosts Sam's blood level — shown graphically in the form of a syringe at the bottom left hand side of the screen. At the top is shown high-score and how much money you personally have gained ill-gottenly.

The maximum score attainable is, we are assured, £64,384. This is not a game that I personally would go wild over. When all's said and done, it has to be remembered that the four houses with 20 screens are just the same house with different levels of difficulty. Some nice graphical possibilities are hinted at, but Gremlin have a little way to go yet if they want to mutate into something bigger and meaner. Keep trying though, lads.

Paul Bond



Icicle Works

Icicle Works

■ *Spectrum 48K*
■ *Boulderdash clone*
■ *Statesoft*
■ *£6.95*

★ ★ ★

DID THE ELECTRO-WIMP band name themselves after the game or vice versa? We may never know. Nevertheless, Icicle Works is a taxing and exciting game which bears many hereditary traits of Statesoft's earlier big hit, Boulderdash, for the Commodore 64.

The similarity lies in tne snow-balls. You dash around the screen, clearing paths and collecting parts of objects. If a bunch of snowballs falls on your head, you lose a life.

There are four main screens apart from the entry screen. This last is quite simple. You just saunter down from the top of the screen, grab a two-part key and decide which set of stairs you are going to go down.

In the first set you assemble a jet fighter and release a stream of water.

(continued on page 41)



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Star★chart

Mama Llama

CBM 64
£7.50
Arcade adventure
Llamasoft

★ ★

Ingenious 10 by 10 rotating grid enables you to select from five scenarios in which you protect Mama Llama and her two babes voyaging through the cosmos. You can place retrogenesis and antigenesis devices into areas of the game to block attacks for you. This is an irritating game to play — games for purists are all very well but we at YC feel Jeff's getting too involved in his own head.

Frankie 2000

BBC Micro
£7.95
Fantastic voyage
Icon

★ ★ ★

Right-hand side shows X-ray view of human body, indicating where your minisub is in the bloodstream. Left-hand side is the arcade action as you journey through the trachea, etc., shooting germs. In the left lung you encounter cigarette ends!

Berks

Commodore C-16 and Plus 4
£6.95
Robotronesque
CRL

★ ★ ★

More genocide. Tool around shooting at pathetic robot Berks edging their way round a total of 32 randomly generated maze screens. Paralyse the flashing diamonds that threaten to crush you. And serve you right.

Major Blink

Commodore 16 & Plus 4
£6.95
Painter
CRL

★ ★

Major Blink is the creator of the Berks. He is harassed by "bears" and drones who try to stop him painting the blocks on the screen. A competent implementation of this old favourite.

(continued from page 39)

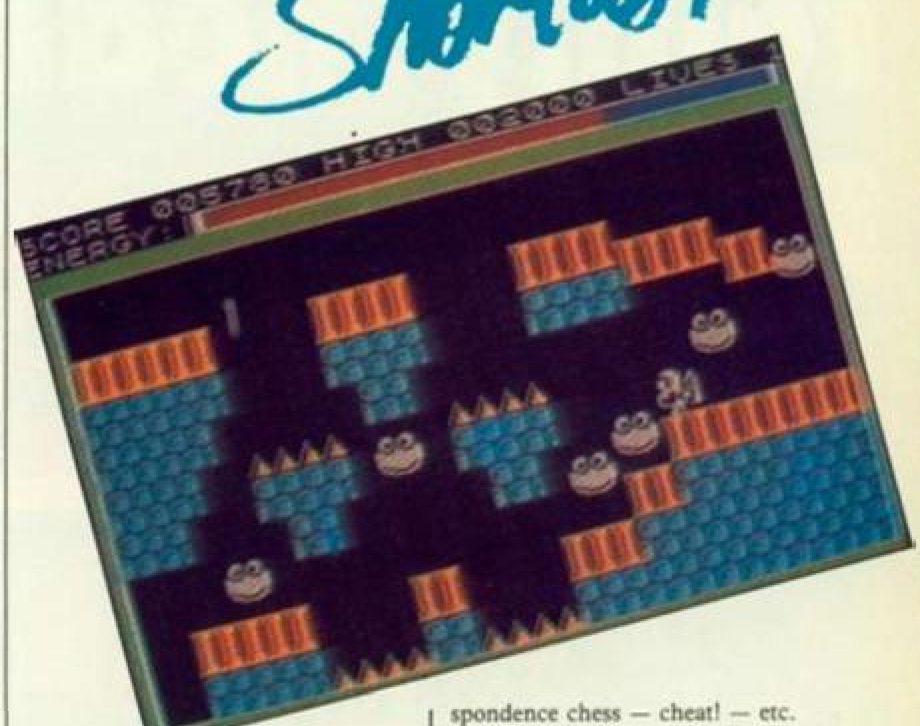
On the second set you build a railway engine while moving around a maze; in the third you attempt to destroy volatile puffins by dropping snowballs on them; on the fourth you assemble a ghetto blaster.

The modus operandi on the last screen is the most ingenious of all. The screen displays a central line of mystery boxes. You knock snowballs down on to them. When you clear a path underneath segments of the ghetto blaster fall from the boxes. You then sweep back and collect the parts. As with the engine and the jet what you are building is gradually displayed on the right-hand side of the screen. Once you have built the radio you start collecting bonus points — but only if you collect the individual letters B-O-N-U-S in the correct order.

Each of the four main screens has exit doors which you use to pass through into ever more mind-boggling levels. You have to get through each part of the game in a certain time — too little time! — this one should appeal to the Chinese puzzle mentality.

Paul Bond

SOFTWARE Shortlist



Bug-eyes

Bug-eyes

- *Icon*
- *Arcade adventure*
- *Spectrum 48K*
- *£6.95*

★ ★ ★

XXABANEANS RULE OK. Well, of course it's not OK since they intend to wipe out all intelligent life and have the universe to themselves. The dummies have invaded earth in a giant starship disguised as a meteorite. Your job is to penetrate down through the 10 levels of the ship and destroy its power generator.

Well-implemented graphics and a sense of humour make this game worthy of comparison with games in the style of Manic Miner. The big-nosed gliding ogre, the terrible twisting thingies, the wigglers and Big Jake all combine to despatch you with a desparing little squeak — all the more pathetic because of the Spectrum's not-wonderful sound capacity.

On the first screen you encounter the stamping stompers, a fiendish arrangement of ascending and descending plungers which make it a little like trying to walk through an internal combustion engine. Your little spaceman can only walk forwards or back, no jetpacking. Timing is of the essence. On most screens it is worth finding a place to ponder on how to scramble through the next set of obstacles.

When you fall through into the second screen you face the blinking bouncers. You also have a problem with disappearing bridges. The combinations of problems seem to grow increasingly more complex as you approach the base of each screen. You might miss the bouncers just to find yourself plummetting onto needle sharp rocks from a non-existent bridge.

Lazer phazer blazers, the third screen, is really two screens in one. There are three layers of ray guns then you have to work through a cavern of spiders casually reeling and unreeling from the roof on their grisly gossamer threads.

Icon may not be a prominent name now, but with quality like this they soon will be.

Paul Bond

Colossus Chess 3.0

- *Atari*
- *Chess game*
- *English Software*
- *£9.95*

★ ★ ★

IS THIS THE greatest chess program on a micro? According to the handbook, Martin Bryant's Atari conversion of his Commodore 2.0 original thrashed 21 other programs mostly by 16-0. That includes Odesta's Chess 7.0 — Apple/Atari — based on a former World Champion program. White Knight II — BBC — it beat 13-3, Sargon III 10-6, and the excellent Parker Bros Chess — Atari, IBM PC — written by David Levy's Intelligent Software (Cyrus IS) — by 12-4. The list does not, however, include Psion's 3-D Chess on the Sinclair QL.

I tested it against the Parker cartridge and it confirmed its form. When it plays in Tournament mode — one of the six available — it claims an ELO rating of 1800 and gives moderate club players like me a challenging game. There are easier modes for beginners, plus Infinite and Problem modes for correspondence chess — cheat! — etc.

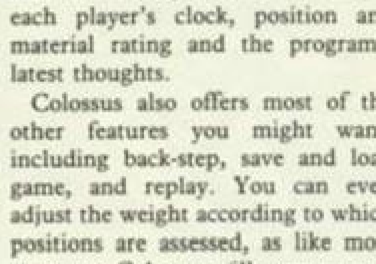
The graphics are legible without being showy. Move entry is simple, by either typing them in (e2-e4) or using the cursor keys. Pressing the space-bar toggles between the game board and a separate screen which lists the moves, shows the time on each player's clock, position and material rating and the program's latest thoughts.

Colossus also offers most of the other features you might want, including back-step, save and load game, and replay. You can even adjust the weight according to which positions are assessed, as like most programs Colossus will swap a small amount of material for a large positional inferiority.

The only major flaw is the handbook, which is almost illegible — black dot-matrix type on red paper — and has a cover of almost unsurpassed embarrassingness.

Atari chess enthusiasts have a number of options — Sargon, Chess 7.0, David Kittinger's 3-D Mychess, Parker Bros Chess — but except for the awful Atari Chess cartridge, they are all at American prices, i.e., very expensive. The fact that this is British, probably better and third to a fifth of the price makes it a best buy on either tape or disc. Highly recommended.

Jack Schofield



Colossus Chess 3.0

(continued on page 43)

SOFTWARE Shortlist

Star chart

Android 1
CPC 464
Vortex
Shoot-em-up
£7.95
★ ★

Vortex made a name for themselves with TLL and Cyclone. They might have done better to bring out conversions of those games rather than this rather tedious game. Primitive graphics combined with naff sound effects and unoriginal material make this possibly their worst release to date. You have to get to the reactor core before it blows up. To do this, you shoot your way through walls, go through mazes, sideways scrolling and plan views. Naturally there are mutants to blast out of the way.

Don Juan
Oric/Atmos
No Man's Land
Adventure
£8.50
★ ★

Perhaps it was inevitable that sooner or later this French software house would turn to the national obsession — l'amour. Given a choice of a number of young ladies to attempt to seduce, of varying coyness, you must seek to entice them into your little love nest by entering the right keyword at the right time. Some nice humourous touches; might provide some entertainment when inebriated.

Rocketball
C64
IJK
Sport Simulation
£6.95
★ ★ ★

"This was never meant to be a game" in case you hadn't guessed this is Rollerball, hailed at the time as a grotesquely violent film IJK have removed all the blood and gore, and discover underneath a pretty trivial sort of game. Not bad as sport simulation goes, but I don't think International Football will be knocked off its perch by this one.

(continued from page 41)

Banjax

- *BBC*
- *Robico Software*
- *Arcade Adventure*
- *£9.95*

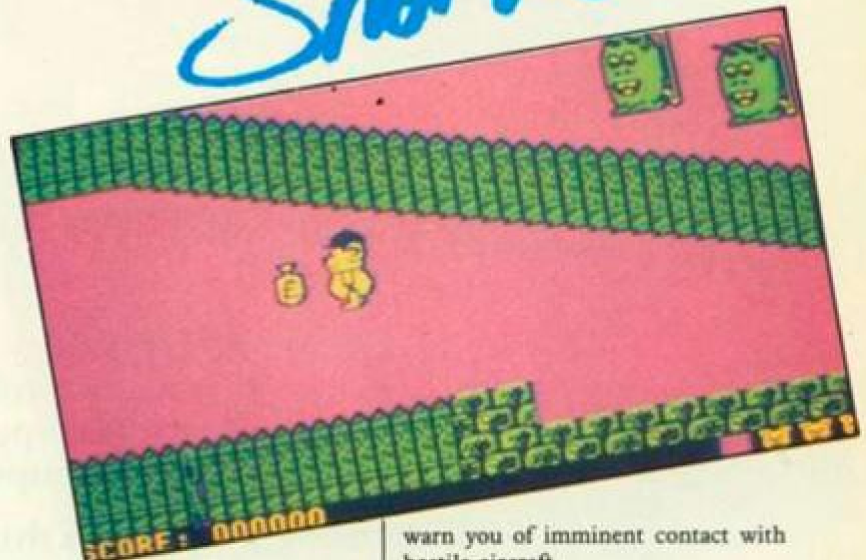
★ ★ ★

BANJAX IS one of those games that is enjoyable to play even though you do not get very far with it. Despite having been given some tips by Robico this reviewer was only able to explore less than a quarter of the game's 240 locations, but liked what he saw: pleasant landscapes, smooth animation, and just enough threats from spiders, blobs and suchlike to keep you on your toes.

It also boasts some of the best graphics in a BBC game since Frak. Like Frak is uses Mode 1 but varies the pallette to give a different four colours in each screen.

Although challenging enough for those who seek challenge, the game has a pleasingly relaxed quality. As the character you control — a bear wearing a baseball cap — is unarmed you must avoid hostile creatures in your path. But if you do not feel up to dodging them you can leave the room. And when you return they are usually gone.

Some rooms, however, are blocked by gargoyles and guards. To gain access more energetic adventures will need to collect an assortment of objects. They will also have to map the territory thoroughly if they are to achieve the goal of the game and reach the Inner Sanctum of the Golden Temple.
Simon Beesley



Banjax



Tempest

Tempest

- *BBC*
- *Superior Software*
- *Arcade Classic*
- *£9.95*

★ ★ ★

IN HIS excellent survey of the arcades, *Invasion of the Space Invaders* Martin Amis calls Tempest the most abstract of all arcade games. The player is in charge of a claw which patrols the rim of a grid, a cobweb-like shape with lanes converging on a hub.

Out of the hub come a variety of what can only be described as animated geometrical figures — spikes, diamonds, stars, and so on. The player's task is to contain them — with the aid of a blaster or, as a last resort, a super zapper.

This version, translated to the BBC with Atari's approval, is the first to appear on a home computer. In its arcade form the use of sharp vector graphics creates a spectacular display as the various shapes cartwheel outwards and then flip along the rim. But much of the game's impact is lost with pixel graphics: lines look too jagged at this resolution.

Nonetheless Tempest is a sufficiently original game to be worth playing however it is implemented. As far as possible Superior Software have recreated its features faithfully, with nine different grids, 255 levels, and, although rather fuzzy, fast-moving graphics.
Simon Beesley

Flyer Fox

- *Commodore 64*
- *Flight emulator*
- *Tymac*
- *£9.95*

★ ★ ★

A NICE SIMPLE stick and string air combat emulator, spoilt somewhat by the premise that Mig fighters feel the need to shoot down civilian airliners in international airspace. They only do it in Soviet airspace. You are piloting a fighter in escort of a passenger jet. The screen display gives you radar on the left, compass on the right, artificial horizon in the centre plus showing altitude, fuel and score. Messages are also flashed up on the altitude reading to inform you when you are at the same altitude as the jetliner and also to warn you of imminent contact with hostile aircraft.


Flyer Fox

The view from the cockpit shows a flat plain criss-crossed by straight lines to form a geometrical grid. This stretches away convincingly to mountains in the distance. When the game starts you are automatically elevated to the same height as the airliner you are defending.

You can't get any higher than the airliner. It always flies at your service ceiling.

Just before the attack the computer speaks — no add-ons required — and says "Mayday". It says other things at other times, all of them unintelligible.

All in all, good graphics, gripping combat action, garbled speech synthesis, all combine to make a tense and enthralling game.
Paul Bond


Dragon Torc

Dragon Torc

- *Spectrum 48K*
- *Arcade adventure*
- *Hewson Consultants*
- *£7.95*

★ ★ ★

MAROC IS back. So what? Well, this is the entity who vanquished the Lord of Chaos and banished him from his earthly realm — a neat thing to mention in job applications. Afficionados of Hewson's Avalon will remember him; more importantly, they will have experienced the lateral thinking necessary to get things done in this program. Hardly anyone does anything for themselves; Maroc kicks off by projecting his soul — not one of the more manoeuvrable souls I may

(continued on page 45)

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Star★ chart

A Day in the Life

Micromega
Spectrum
£6.95
★
One of those twee games featuring you-know-who (snigger, snigger) a bloke with bald head and glasses who is (tee-hee) quite important in the (ha-ha) U.K. computer industry.

Oh no, oh no it's no good I can't hold back, it's Sir Clive and the game has really primitive graphics.

Dukes of Hazzard

Elite
Spectrum
£6.95
★ ★ ★
Them good ol' boys can now just roll along your Spectrum. The screen display is excellent and the game is rather more playable than some of Elite's previous offerings.

Up to now the company's main achievement has been the holographic label on the outside of the cassette.

The Duke boys have to make it to the start line of the road race but helicopters, Hell's Angels, and of course, Boss Hog, all conspire against them.

They drive along the motorway changing lanes and chucking bombs at on-coming vehicles. More fun than a traffic jam.

Pacmania

C-16
Pacmanesque
Mr Chips Software
£5.99
★ ★ ★
The old arcade classic revisited on the Commodore 16. Afficianados of Acorn Snapper or other more traditional implementations of the Atari original will probably find themselves shocked and stunned by this version.

The ghosts are completely anarchic, they hold to no known norm of civilised behaviour, recovering almost instantaneously.

(continued from page 43)
say — but quite a lot of Maroc's soul's work is done for him by a servant creature.

To move, you get the arrow pointing to move. Press the fire button once and the scroll changes to show the move you have selected and how many more uses of it you have left. "Project they soul" hints the scroll. In the style of Gargoyle's Tir Na Nog, you have to move around on pathways.

To access the servant, you scroll as before and press the fire button twice. A small will-o'-the-wisp appears which you control with the joystick instead of Maroc.

The graphics are rough — scrolling, sacrificing smoothness for colour, so sometimes irritating to the eyes. But I am sure that the actual mechanics of the game will prove an irresistible addictive factor to adventure fanatics.
Paul Bond

SOFTWARE Shortlist

Body Works

- *Spectrum*
- *Genesis Productions*
- *Educational*
- *£14.95*

★ ★ ★ ★

IS THERE a doctor in the software house? Yes, there is, and it's Dr Jonathan Miller, star of stage, screen and operating theatre. If you don't remember Beyond the Fringe you may remember the mammoth documentary called The Body in Question.

The program in question is based on the pop-up book *The Human Body*, also published by Genesis Productions, a new company specialising in books and computer software. Consultant physician David Jefferys also worked on the project and one suspects a lot of the real slog was done by Five Ways Software's Andrew Rutherford (graphics), and Roger Moffat (code).

The program takes you on a trip round your body, dealing with cells, digestion, respiration, circulation, nerves, and muscles culminating in a marathon run simulation.

Interaction is the name of the game. Apart from pushing the space bar to animate each function, you can key in your own data. So you can choose between fats, proteins and carbohydrates in the digestion program.

It's not a biology revision program — it doesn't claim to be.

What it is, is an informative and interesting way of putting ideas together for yourself.

The final program in the suite, Marathon, is like a flight simular for the human body. Running eight times faster than real time, the simulation allows you to enter a course from 5-26 miles.

The body monitors displayed on the screen in the form of black graphs include heart rate and output, stroke volume, temperature and lactate.
Paul Bond



Body Works

Shadowfire

- *CBM/Spectrum*
- *Beyond*
- *Adventure*
- *£9.95*

★ ★ ★ ★

IN THIS ADVENTURE your quest is to transport your crack and deadly — why can't they be bungling and harmless for a change — team onto the enemy spaceship. Once there, you have to fight your way through the corridors to rescue Ambassador Kryxix.

All this in 100 minutes of real time before the Ambassador cracks under interogation and tells the bad guys Prince Phillip's Prestel mailbox number. There are six members of your party, each of which have particular strengths and weaknesses. There are various characters around to fight off, doors to open and things like the self destruction mechanism of the ship left lying around.
Lee Paddon

Super Huey

- *Spectrum*
- *Cosmi/U.S. Gold*
- *Simulator*
- *£11.95*

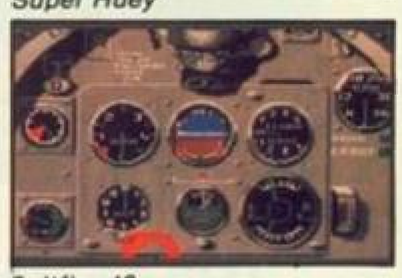
★ ★ ★ ★

THE GAME goes out of its way to take you gradually through each learning stage till you gain mastery of your "flying gearbox". There's plenty of clear instruction in the manual, including a step-by-step guide on how to get into the air, no mean feat! Once up there your friendly computer will provide you with handy hints on how to stay there.

Once you think you've got the controls sussed, you're ready to proceed onward.
Lee Paddon


Shadowfire


Super Huey


Spitfire 40

Spitfire 40

- *Commodore 64*
- *Mirrorsoft*
- *Simulator*
- *£9.95*

★ ★ ★ ★ ★

THERE ARE three display's — the traditional out-of-cockpit, the obligatory map, and a superb reproduction of the Spitfire instrument panel which takes Commodore graphics to new heights. Not combining the instruments with the forward view has two advantages, better instruments and a better view from the cockpit.

Three game modes are included: practice, combat practice and combat.
Lee Paddon

Could YOU get a Newspaper Scoop?

▸ Addictive launch STRINGER ◂
Reporter Extraordinaire in 'The Hotel Caper'





STRINGER is an arcade adventure game in which you are a press photographer for the "Daily Blurb" set the task of snatching a shot of a Film Star, Polly Platinum in an hotel. To hinder your attempts your camera, flashbulb, press pass and the key to the lady's room have been hidden in the hotel and these items have to be recovered before the all important shot can be taken. To add to your troubles the hotel staff are bent on catching you before you reach your goal and your Editor has set you a strict deadline for the completion of the task.

The game has 5 skill levels and 10 screens of increasing difficulty. It is tantalisingly playable, graphically excellent and, of course – Addictive! Available .... Commodore 64 £6.95

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Software Star
"It carries the Kevin Toms hallmarks of attention to detail and carefully tuned difficulty" *Popular Computing Weekly, February 1985*
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NEWS
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The crystal ball

There's some exciting news from those adventure writing geniuses at Level 9. Later this year, they plan to release the first in a series of mega-adventures which they say will be as large, complex and detailed as those published by Infocom. And don't worry if you haven't got a disc drive — they'll also be available on cassette. Cost is likely to be around £15.00.

Enterprise owners have not been overlooked — Level 9 adventures can now be obtained for this machine.

Other imminent new releases from Level 9 include Red Moon — £6.95 — and The Worm In Paradise — £9.95.

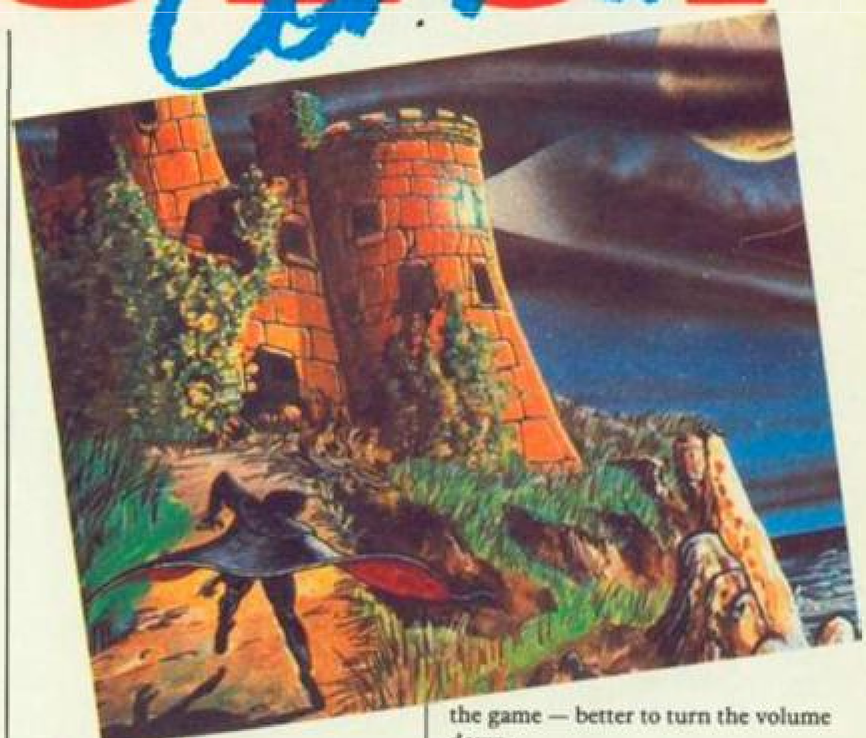
Amstrad and MSX owners can now try Melbourne House's famous Hobbit adventure — £14.95 — for themselves. In addition, a reworked version of The Hobbit, on disc only and for Commdore 64, Apple and IBM PC owners, is available in the UK. The new version includes extra problems, additional text, larger vocabulary, enhanced graphics and, for the Commodore 64, complex music throughout the game.

A helping hand

Here's a trio of tips for Spider-Man devotes:
Sandman proving a gritty problem?
ROGN EHT G NILI ECOG
Not getting far up the elevator shaft?
PU OG NEHT UP HS UP
Madam Web a mystery to you?
OTRE HKSA UOYF IUOY ROFS GNIH TNAC SLLI WEHS
Yours in adversity and adventure,
HUGO NORTH.

QUEST Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.



Heroes of Karn

■ *Spectrum 48K*
■ *£6.50*
■ *Interceptor Micros*

HEROES OF KARN is a text and graphics adventure that first appeared for the Commodore 64. It proved to be very popular and has now been translated for the Spectrum.

Although the plot and puzzles are identical to the 64 version, the Spectrum program wins hands down in the graphics department, has a small edge in the text input contest but, naturally enough, loses by a mile in the music stakes.

Unlike the 64 version, not every location is depicted graphically but those that are included are magnificent. Credit for the superb computer artwork goes to Terry Greer, as credited by the cassette inlay. The pictures appear instantaneously and are beautifully drawn using colourful high-resolution graphics.

The Spectrum's lack of sound capability means that the impressive music of the 64 version has had to be foresworn. However, the input parser has been tidied up making the acceptance of more complex commands much easier to use.

The plot involves you searching a fantasy land for not one but four lost heroes. The adventure has a host of puzzles, most of which involve hitting on what object to use with what item. The heroes themselves have different capabilities and in certain situations can do things that you could not do by yourself. It is therefore essential that you locate at least one of the lost heroes quite quickly. Finding the first lost hero, Beren, turns out to be quite easy, fortunately.

A thoroughly enjoyable adventure with some of the best graphics on the market.

Grand Larceny

■ *Commodore 64*
■ *£7.95*
■ *Melbourne House*

THIS IS THE second of what Melbourne House call their "joystick adventures". If you've played Zim Sala Bim, their first one of the series, then you'll know precisely what they mean. The adventure is a combination of traditional text and scrolling graphics.

The plot involves your recovering some secret plans which are about to be smuggled out of the country. If the enemy agents believe you are on to them, they will stop at nothing to escape.

You start the adventure outside a large hotel, your first problem being to get inside. The rest of the action takes place inside the hotel which you can explore by riding in the lift or nipping up the fire escape.

The cassette inlay describes the game as having "smooth, arcade style graphics" and "every location brilliantly displayed in 3-D". What you actually get is a minimally animated figure walking in front of some quite uninspiring and very two-dimensional backdrops.

The figure ambles to the left or right in response to the movement of your joystick — or by pressing the "less than" and "greater than" signs on your keyboard. The background scrolls in the appropriate direction.

The graphics mostly consist of hotel rooms and are simplistic stylised representations. Some fairly nondescript music plays throughout the game — better to turn the volume down.

The bottom part of the display is reserved for text input and output. When your character is stationary, you can type in the usual sort of two word command e.g., get knife. The program only recognises the first two letters of each word so abbreviated commands are acceptable. Response to your input is instantaneous but terse.

There seems to be a non-fatal bug in the program. When you move to the extreme left of a floor above ground level and type Look, the description given is not of that location but relates to a location on the floor above.

I found Grand Larceny to be quite tedious, lacking in interesting puzzles and totally devoid of atmosphere. However, if you enjoyed Zim Sala Bim, chances are you might like this one.

Quest for the Holy Joystick

■ *Spectrum 48K*
■ *£4.95*
■ *Delta 4 Software*

THIS QUILLED text adventure is a zany spoof set around the ZX Microfair. You'll encounter many well known characters and companies who bear more than just a passing resemblance to famous names from the world of computer games and adventures.

The is also a sequel — Return of The Joystick — which has graphics and includes some extremely funny pastiche title screens.

The games are available by mail order (04893 5800) and are sure to provide you with many a belly laugh.

COMPUTER C

Meirion Jones investigates a potentially explosive new crime wave instigated by that master of the keyboards — the hacker.

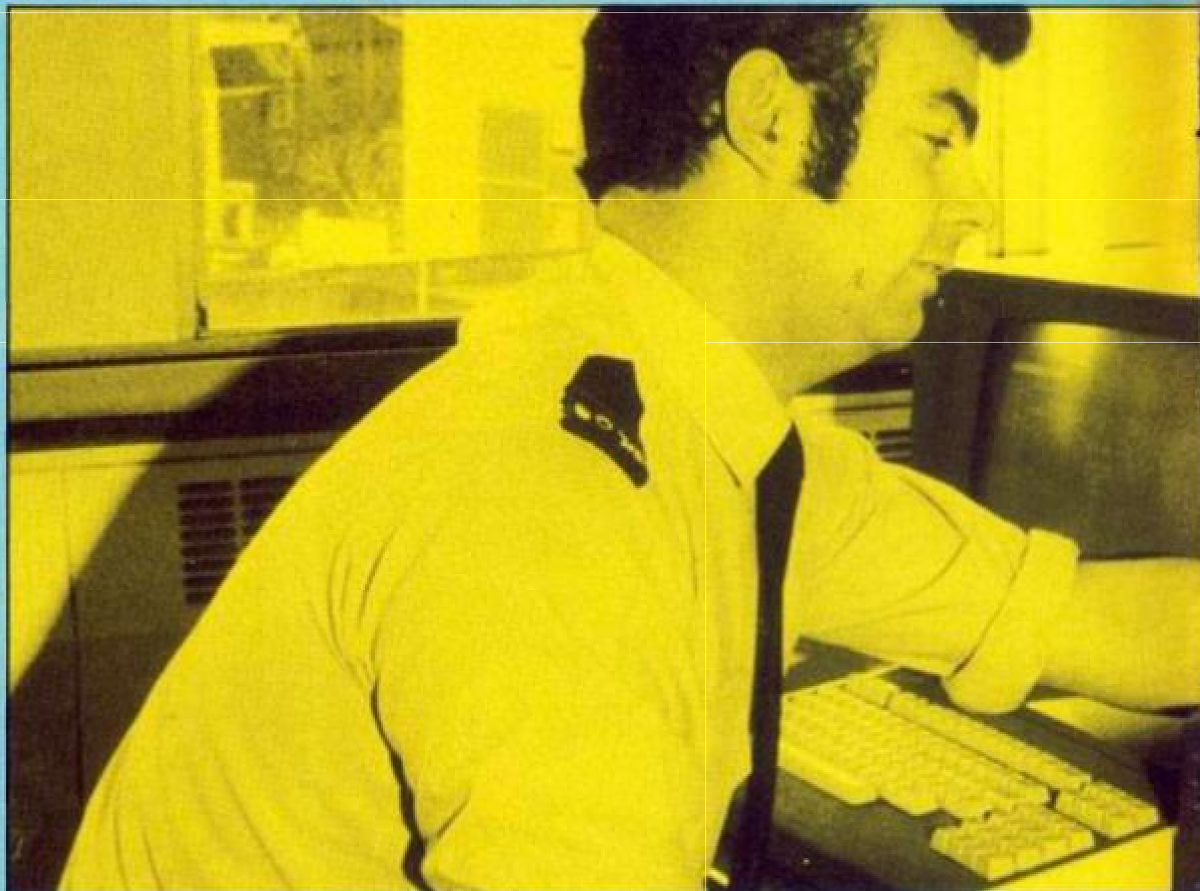
COMPUTER CRIMINALS will steal at least £1 billion in Britain this year — that's a Great Train Robbery every day in 1985. But unlike the train robbers, most of the electronic thieves will get away with it and even if they are caught, financial institutions are unwilling to prosecute because public confidence in them might collapse if people knew how easy it had been to breach their security.

In America the problem is worse still. Computer fraudsters range from high-ranking company officials who have invented whole communities on magnetic tape to make business look as if it's booming — as in the multi-million dollar Equity Life insurance scandal — to individuals who have resuscitated thousands of dead clients in order to pay the pensions into their own accounts.

Interfering with delivery and accounts programs has also produced spectacular results, in one case the disappearance of 200 rerouted freight wagons, in another the collection of a million dollar's worth of components without payment.

And in the unlikely event of the fraudster ending up in jail, white collar criminals don't need to dirty their shirts digging tunnels to escape, they can always follow the exâmple of the Ohio prisoner, who having access as a trustee to a terminal in the library simply used it to bring forward his release date on the computer.

These are just some of the cases that have been discovered and as Brandt Allen, an American researcher who helped to publicise the problem of computer crime in the early 1970s writes, "the first time I assembled a set of computer fraud cases, I was struck by the incompetence of most of the embezzlers who had been discovered. Since the computer provided such a high degree of fraud potential, I wrote at the time, "I can't help wondering what the really clever people are doing" with the computer. I think the biggest computer frauds are still to be revealed."



"You never know who's on the end of a hacked line. Watch out, there's a computer cop about."

All this pales into insignificance with the fears of Mr X, a British computer consultant who does not wish to be named. So far, most computer crime has been the work of professional criminals or employees who have taken advantage of their privileged use of a computer.

The amateur hackers — equipped with nothing more than a home computer, modem and a quick brain have been more of a nuisance than a threat to the big companies. Despite the fantasies of films like War Games where global thermonuclear war is almost initiated by a teenage hacker, the real-life exploits have been more usually of the order of the diversions of Pepsi-Cola shipments across Canada, which the pupils of Dalton School, Manhattan, reportedly perpetrated, or again in New York crashing a TV network.

But Mr X believes that all this will change in the next couple of years as modems become as common as data recorders and 16 and 32 bit chips give home micros the capabilities of the minicomputers that run companies today. Six years ago a powerful VAX 750 mini cost £80,000 for a machine with 500K Ram and a 15 Megabyte hard disc drive. Atari plans to offer similar kit for less than £2,000 this year and companies like Commodore and Sinclair will not be far behind.

Armed with that power, the hackers may take some stopping. Mr X believes that if something like the mining dispute was to happen again organised team of hackers could cause power cuts, "you don't need pickets,

HOW IT ALL BEGAN

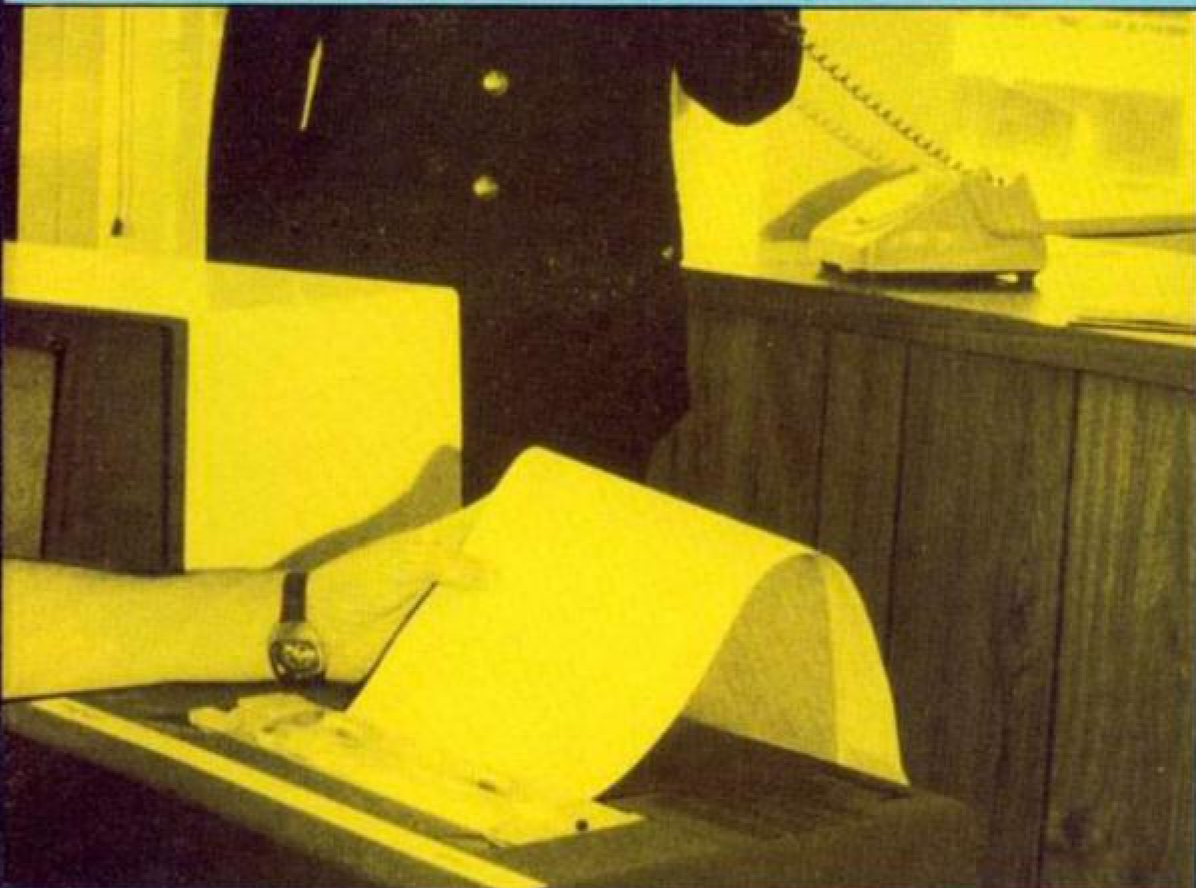
Early computer crimes were unsophisticated but effective. One simple trick, first used in New York was to remove the blank deposit slips on the counters of banks and replace them with apparently blank slips encoded with the fraudster's account number.

When customers filled in the slips as they deposited money the fraudster's account was credited — and with a carefully timed withdrawal from the account the fraudster could be away before anyone noticed that their accounts were awry. Programmers with criminal tendencies who found themselves writing financial software opted for more subtle tricks — the so-called Trojan Horse, a fragment of code buried in a program which looked secure from the outside but which could trigger an unscripted diversion of funds.

These became known as Time Bombs if they were triggered by the central processor clock and Logic Bombs if they were set off by a particular event which might be triggered to suit the programmer. Rather than these one-off raids some villains incorporated subtle routines which stole almost imperceptibly small amounts of money at a time — rounding up cheques by a penny or a cent for instance and sending the difference to their accounts — but on a large number of transactions.

This Salami technique can be very effective in large organisations — one service transfers £27,000,000,000 a day across the Atlantic. You would only need to divert one part in a million to make yourself a millionaire in a matter of weeks.

RIME REPORT



you could damage our grid capability — they could have brought the country down". He also suggests that groups that are opposed to deploying nuclear weapons, like the Greenham women, might be able to disrupt Ministry of Defence Systems — although Sabine Kurjo, who organises anti-war computer users in a Peace Network, has never heard of any such attempts, "none of us would dream of hacking into military computers".

Government cuts which affect scientists' jobs could also be dangerous says Mr X. "Ministry of Defence people are working on systems which can break any computer on earth. The government is paying them to do it — put a few of them out of work . . ."

Government spying agencies not only break their way into private computers, they sometimes deliberately make the job easier by reducing the security of commercial codes.

In America the National Security Agency which runs most of the spy satellites and surveillance interfered with the choice of the National Bureau of Standards Data Encryption Standard to make sure it was set at a level, 56-bit key with 64-bit cryptogram, that the NSA could break. Mr X thinks that the threat posed to major companies by hackers is not just the loss of few percent of turnover as with shoplifting but the complete destruction of their whole organisations. "It's not the petty pilfering, or even the major pilfering that worries them now. If you want to bring down a major company, even IBM, all you have to do is modify profit margins."

Mr X sees a total and unavoidable collapse of companies as the hackers are let loose.

Faced with such apocalyptic predictions it is no wonder that Scotland Yard's computer crime chief Detective Inspector John Austen is calling for a ban on books like the recently published *Hacker's Handbook* which tells you how to set about breaking and entering other people's mainframes down your phone line.

But the book's author, who goes by the name Hugo Cornwall on the title page, believes that hacking is harmless so long as the participants follow a sort of countryside code: "Don't manipulate files unless you are sure a back-up exists; don't crash operating systems; don't lock legitimate users out from access; watch who you give information to; if you really discover something confidential, keep it to yourself." Cornwall also believes that "most hackers are not interested in perpetrating massive frauds. Modifying their personal banking, taxation and employee records, or inducing one world super power into inadvertently commencing Armageddon in the mistaken belief that another super power is about to attack it."

Cornwall prefers to think of hackers as the pranksters who raided Prince Philip's Prestel mailbox and bedevilled every public demonstration of Telecom Gold. Despite assurance from Telecom that the system was secure, Radio @'s Chip Shop presenter Barry Norman found his Gold mailbox raided on a number of occasions and the first demonstration of Telecom Gold on live TV was also disrupted by the appearance of a hacker's message. ■

WATCH OUT–HACKERS

Police fear that the current publicity will give away the "secrets" of hacking and so open up the possibility of computer crime. But once a hacker has the necessary equipment — micro, phone line and modems capable of transmitting and receiving at any baud rate in any protocol and data format which the target computer might use — much of the necessary information such as passwords for breaking into systems is easily available.

Bulletin boards — the electronic noticeboards accessible with a modem, or their more prosaic counterparts, the tatty pieces of paper passed around at computer clubs, often carry a few interesting numbers for enthusiasts to try. For a professional criminal many passwords are easy to find. At exhibitions an access number may be taped to the side of a machine in full view of the public, or typed in while people are watching. A single repeated symbol from the keyboard may trigger a test number and many people use their initials or birthdays as passwords.

Increasing the number of passwords needed to access a system can also cause problems. Clive Blatchford — in charge of ICL's computer security — told a computer crime conference last month that almost no-one who has to remember more than two Personal Identification Numbers trusts their own memories enough not to carry them around in a diary or on a slip of paper. Blatchford told his audience — mainly people in charge of computer security that if he picked their pockets he would expect to find out the PIN numbers for at least one in three of them.

If the hacker has most of the digits of a number, an autodialler can run through the remaining possibilities — although most systems now cut off a modem after two or three false attempts. The professional criminal might buy specialist equipment which can analyse a stream of data and tell you what protocols and formats are being used. Even closed computer networks can be cracked if you can get close enough. £200 would buy a would-be villain a device which could measure the variations in electromagnetic pulse put out by a computer. According to Blatchford an unscreened terminal puts out 150 microvolts 30 feet away — while the device can pick up fluctuations as low as one microvolt. By listening in to the beginning of each transmission the bug could capture the passwords and identification codes. No wonder that some companies now spend up to £500,000 to screen a room which is going to take a £50,000 computer.

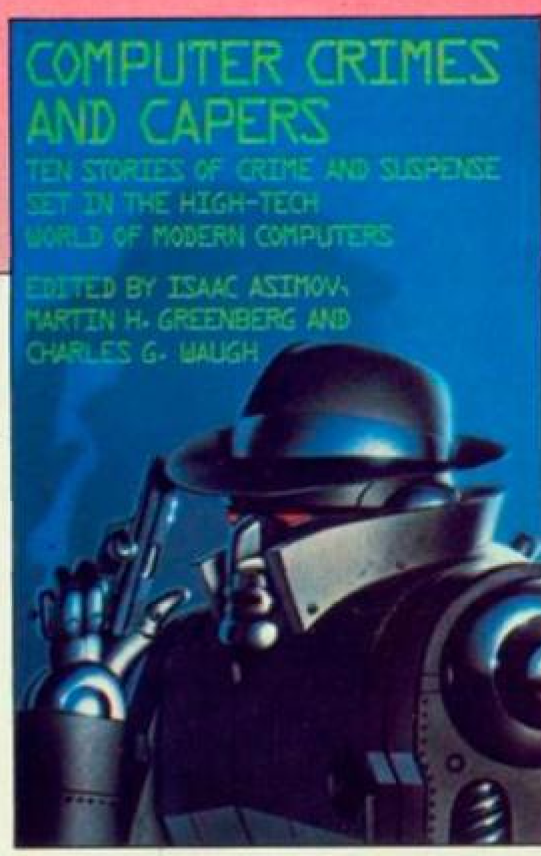
WIN AN ENTERPRISE *competition*

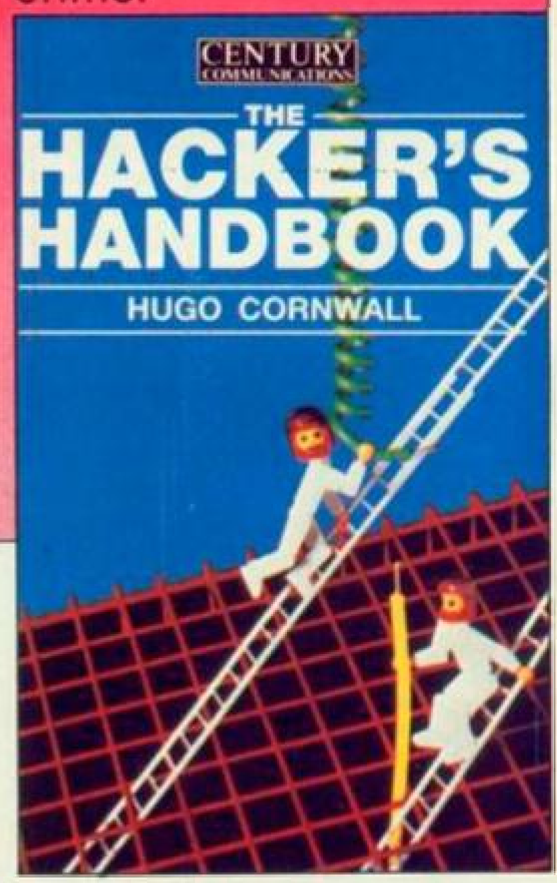


Win £600 of prizes from Enterprise for the best idea how to cheat in an exam or pull off a scam using a computer. Five runners will each get two great books on hacking and computer crime.

Enterprise computers is putting up its first 128K Ram computer together with a printer and software to make a fabulous first prize.

Runners-up can brush up their cheating with Viking Press's Isaac Asimov collection of silicon science fiction called Computer Crimes and Capers plus...





...The Hacker's Handbook by Hugo Cornwall released by Century which might help you break into the computers that store examination records.

RULES

- The winner of the competition will be the person who, in the view of the editor, comes up with the most amusing or clever idea for a computer cheat or scam.
- The name of the winner will be printed in the August issue of *Your Computer*.
- All entries must arrive at the *Your Computer* offices by the last working day in May 1985.
- Each person may enter the competition only once.
- Entries to the competition cannot be acknowledged.
- No employees of Business Press International or their relatives may enter the competition.
- The decision of the editor is final.
- No correspondence on the result of the competition will be entered into.
- Business Press International assumes no responsibility or liability for any complaints arising from this competition.

YOUR COMPUTER COMPETITION

Don't forget to enclose this coupon, or a photocopy of it, when you send your idea, which can be written or drawn or both, for cheating in an exam or pulling off a scam with a computer, to *Your Computer*, Room L221, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Name ______________________

Idea ______________________

Address ______________________

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REVISION SOF

EVERY YEAR the nation is swept by an epidemic of exam fever. It begins around Easter and reaches its climax in May and June. Most of the victims suffer no lasting damage, although some do have a relapse known as "retakes". Usually, the trouble passes as quickly and strangely as it has started.

There is no known cure for the complaint; time is the great healer. The only thing the victim can do to alleviate the condition is to take large preventive doses of revision, beginning in mid-winter. In the right doses, revision lessens mental tension and ensures that there will be no need for the misery of retakes.

Many potential sufferers from exam fever will be owners of home computers. Many of the large publishing companies are now producing revision software for a wide range of subjects and machines. Can they help?

In some cases, almost certainly. Penguin Study Software has come up with a series of programs on Shakespeare's plays which shows just how much good educational software can achieve.

The programs run on a database containing three sections: people, themes and acts. So the student can search through each act, or the whole play, searching for references to particular characters or themes. But much more interesting, and useful, is the ability to combine a particular character with a theme in the search.

In Julius Caesar, for instance, the program lists 17 themes ranging from Alchemy to Weeping. Let's say you choose Ambition, combining it with the character of Caeser, and search through the whole play. The screen will display line references — to the Penguin edition, of course — and a comment, e.g.

Pete Connor studies revision programs.

"Look at Act 1 Scene 1 Line 72. Flavius expresses fear, later developed by Cassius, that Caeser's ambition might plunge Rome into dictatorship." Sometimes another reference will be given, or a question for the user or a suggestion that another theme will be worth exploring.

Thus the program constantly makes the user think for himself as well as providing information. It's the kind of service a good teacher would like to give, but never has the time — or perhaps the database — for.

English Literature lends itself readily to this kind of stylish treatment. Other subjects are more traditionally presented and are much heavier going. French, for instance. You're obviously not going to get much guidance on your accent from a computer. And, sadly you won't get an awful lot of guidance on anything else of great value.

In the Hill MacGibbon/Pan Study Aids Software series you get two tapes and the Pan Study Aid book in a hefty £14.95 package. The program starts off with Diagnostic Test in which you have to choose the answers from an accompanying booklet. On completion you get a report showing how you've done.

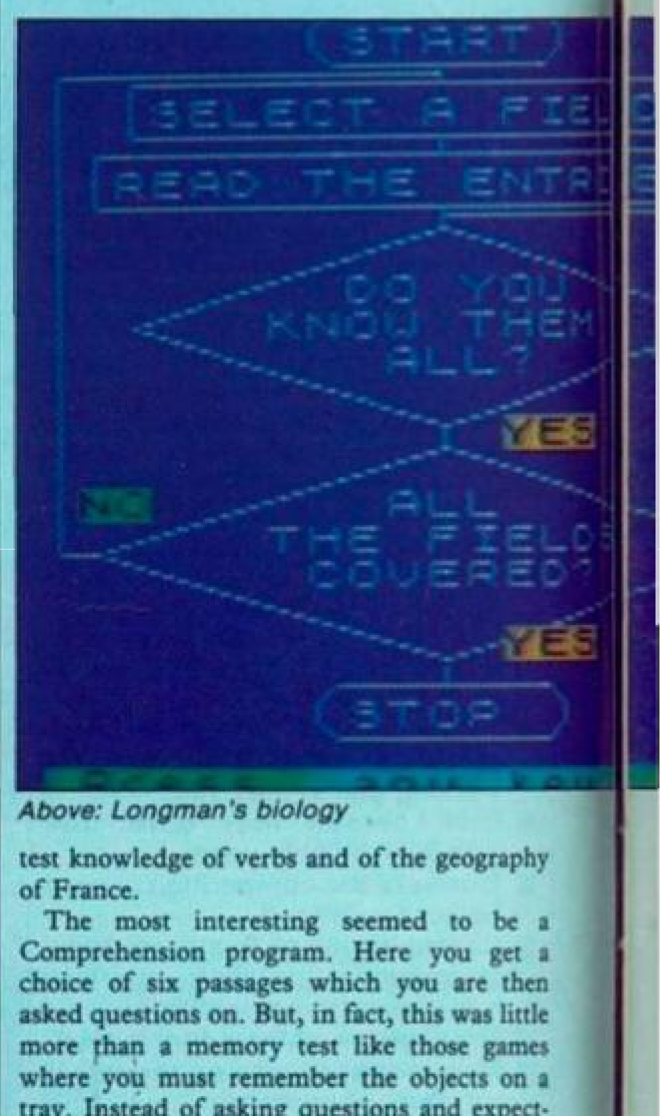
The rest of the program is taken up with sections on grammer and areas of vocabulary. It's pretty simply presented, and will certainly ram home all those rules about the agreement of past participles etc., but it doesn't really seem to provide anything to merit the time taken to load it up.

With the Longman French program on the Spectrum you get only one tape. It contains five programs. Two of these — Lexis 1 and 2 — are pretty dull vocabulary tests. The others test knowledge of verbs and of the geography of France.

The most interesting seemed to be a Comprehension program. Here you get a choice of six passages which you are then asked questions on. But, in fact, this was little more than a memory test like those games where you must remember the objects on a tray. Instead of asking questions and expecting grammatical answers, the student is merely required to reproduce exactly each sentence in the passage. All this is accompanied by atrocious "drawings" designed to jog the memory.

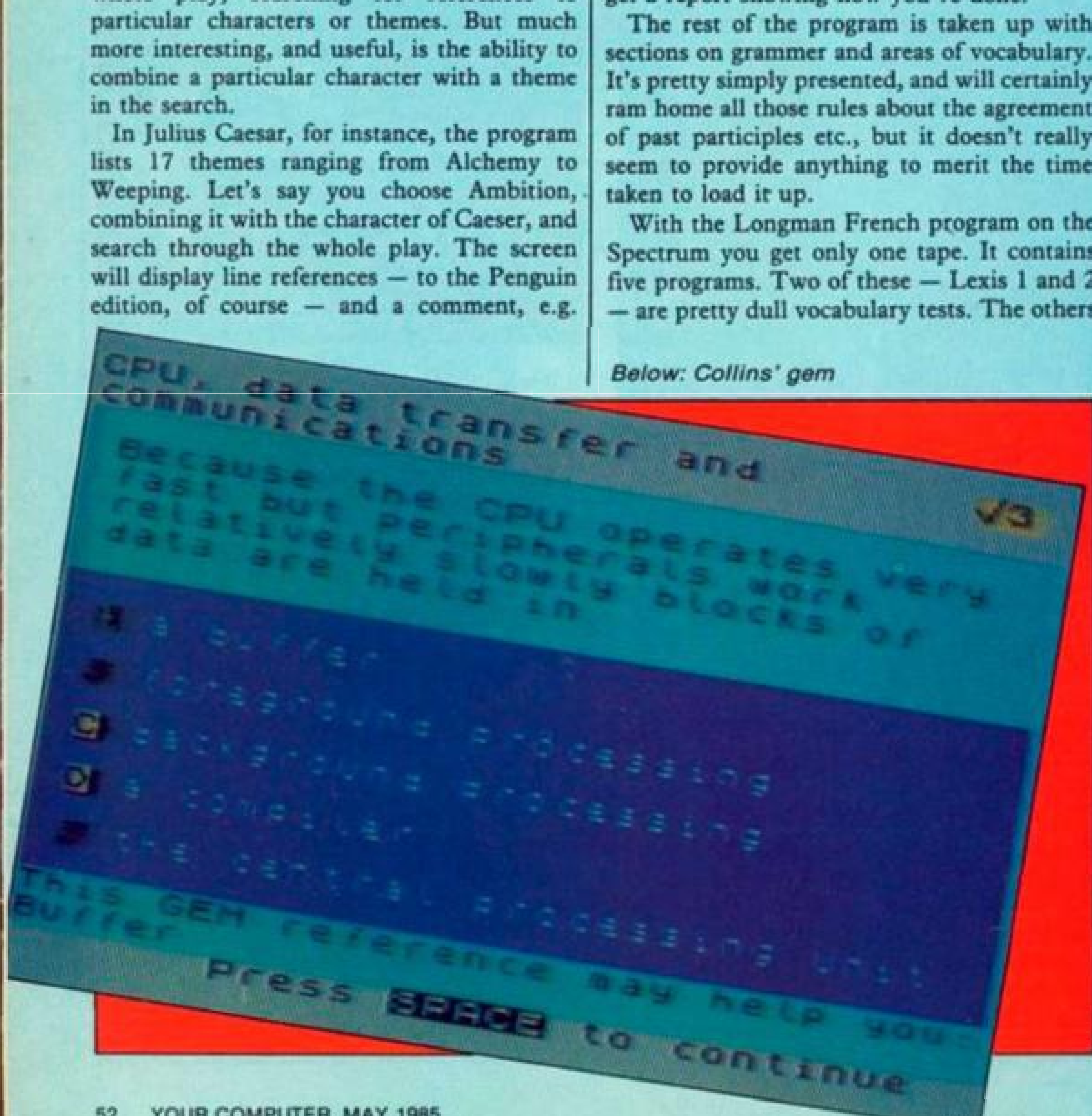


Above: Pan biology

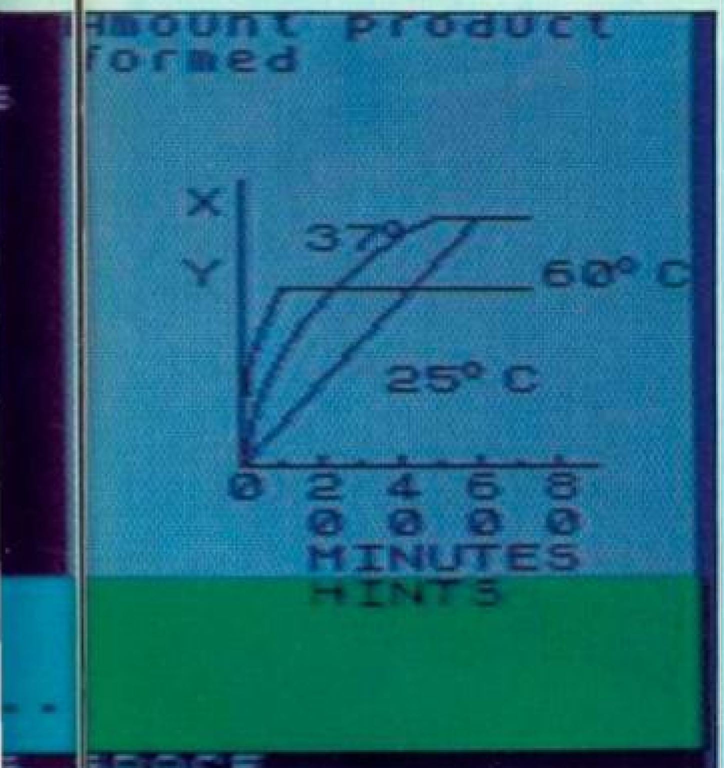


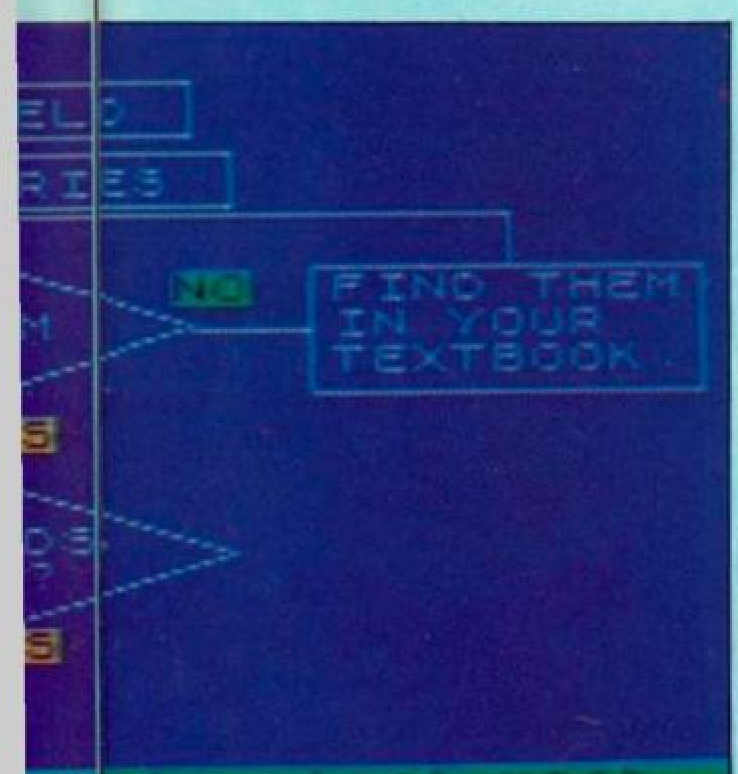
Above: Longman's biology

Below: Collins' gem



TWARE REVIEW





The trouble with language programs is that computers just don't understand what they're talking about and so can only give a very limited number of mechanical and not very useful tests. French is one subject where you're better off with a book, your notes and a teacher.

Biology at least allows you to use diagrams and Longman, Hill MacGibbon, Collins and Scisoft programs all rely heavily on them. Word games are the other favoured means of learning. The Longman package has five programs on the one tape. Of these, Skeleton is the most fun. It's a word game based on hangman in which each correct answer adds another bone with its name.

It's not a terribly original idea, and it hasn't really got much to do with the scientific method, as the blurb claims. But it is quite enjoyable, reinforces the knowledge and covers seven topics. The other programs cover heredity, food and kingdoms.

The Pan/Hill MacGibbon offering is similar to the French package, beginning with "diagnostic tests" and then going on to learning modules covering most of the topics on an 'O' Level syllabus. Since it has two tapes it covers rather more ground than the Longman program. The diagrams are all very clear and the program will be useful to the student — but not that much more useful than his or her own notes. If he or she has got any.

Collins Revision Software is another tape/book package: one tape and the Collins Basic Facts on Biology. The first of the four programs, Tester, asks you to give the answer to definitions from a mixture of topics. Get it wrong once and you're given the first letter, twice and you're referred to the Basic Facts, a third time and you're given the answer.

The other three programs are all diagram-based. The first one, for example, offers the structure of the flower, structure of the eye, kidney tubule, section through a leaf and the human digestive system. The exercises consist of labelling the parts, with plenty of help available if you need it. Again, most of the syllabus is covered and the program will be useful to the student. A pity, though, that the diagrams weren't just a little clearer or quicker on the draw.

Scisoft's Biology is the weakest package under review, even though it does proclaim on the cover "Approved by teachers". Which ones? Where?

Most of it is multiple choice questions on various topics. But each section contains only 20-32 questions, which doesn't really seem enough. There is also a diagram program. The package doesn't really have enough to offer the student in terms of variety or fun. Both Longman and Collins offer Computer Studies revision software, the Collins once more coming in a pack with a Gem Basic Facts.

Longman's tape contains four programs covering most of the syllabus. Topics include Basic routines, file-handling, logic and low-level language. This latter is dealt with in the program Visicode, which gives you 15 commands in a low level language and allows you to write your own programs. This is a particularly useful sction; explanation is clear, graphics are good and it's easy to get any help you might need.

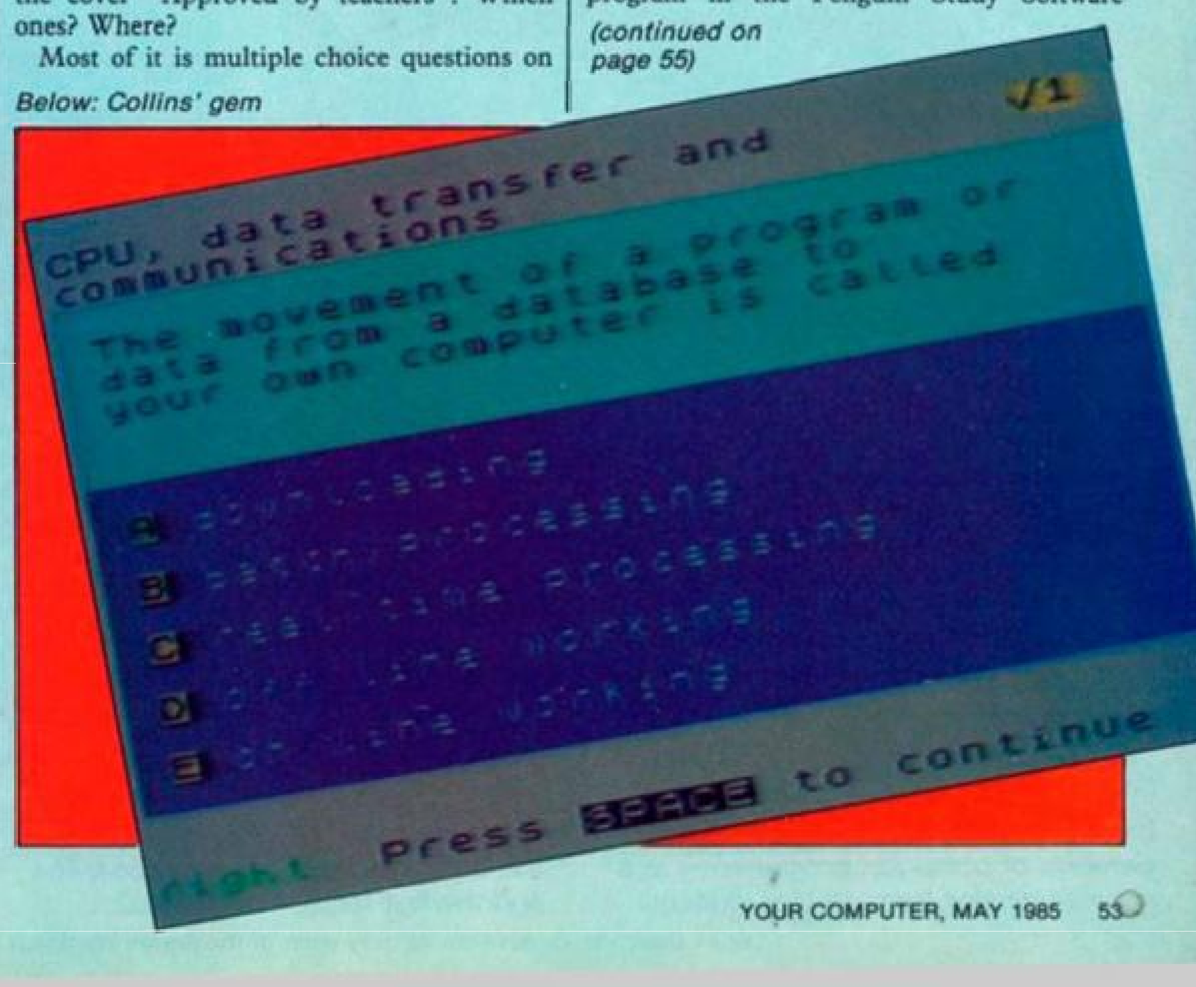
Collins's Computer Studies has the same format as their Biology; three programs in which you must label diagrams and two with multiple choice questions. The program covers much the same ground as Longman's, but is less well organised and therefore not quite so useful. It also contains a truly awful "game", based around darts. It's supposed to be fun, but it isn't.

Longman's do a Physics program as well, and it's pretty good. The four main programs are Formulae, Circuits, Light and Machine. Circuits contains two sections on Ohm's Law, the first of which is a graphich demonstration of the way that diodes and transistors work. It's very clear in its explanations, although the diagrams are constructed rather slowly. The rest of the package is of a similarly high standard.

But it's put in its place by the Physics program in the Penguin Study Software

(continued on page 55)

Below: Collins' gem



An Introduction to Computer Programming

Realise the Potential of your Computer



© Video Classroom

THE BBC & ACORN ELECTRON

First Steps in BASIC

The user guides which are supplied with the BBC Computer and the Acorn Electron are excellent reference books.

There are also lots of very worthy books on sale which attempt to teach people how to program in BBC BASIC.

However learning a complex subject from books alone can be a very boring and daunting process.

There is a need to present the essential elements of computer programming in a more interesting form, so that students can gain the basic knowledge they require in order to further their studies, using the many books which are available.

The VIDEO CLASSROOM is designed to meet this need.

Other subjects in the VIDEO CLASSROOM series includes:

First steps in BASIC for Sinclair Spectrum, the Commodore 64, Amstrad 364/464 and the first steps in MSX BASIC.

For more details on the 'Video Classroom' Clip this Coupon

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Market Square, Biggleswade, Beds.
Telephone: Biggleswade (0767) 318844

VISA

Video Classroom comes from the originators of the Gemini Integrated Business Systems

(continued from page 53)

series. This really is a very superior product, almost meriting the blurb's claim that it's "the next best thing to having your own private teacher."

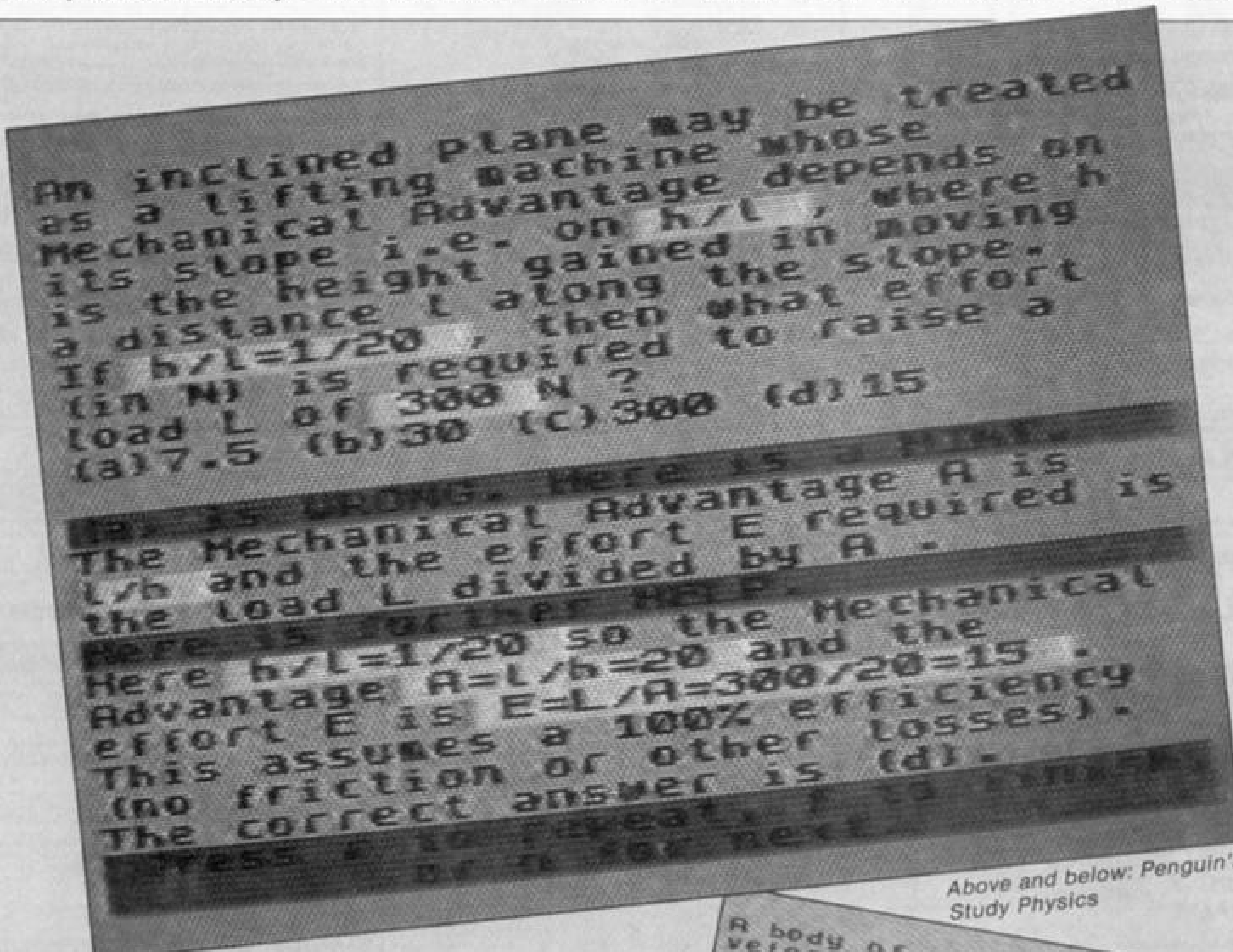
There are two tapes with four programs: Mechanics and Units; Heat and Sound; Electricity and Magnetism; Light, Atomic and Nuclear Physics. Each is presented in a multiple-choice format with a help facility. So, if you're stuck on a question, you can first get a hint, then a detailed explanation with the answer.

The program has a very sophisticated randomising facility. If you want another question on a topic just covered you'll get something similar, but definitely not the same. And the questions are not easy — the program will be useless unless you really have done the work. Which is as it should be in a revision program. Not only is this program more academically useful than others considered here, it is also much classier. It just looks better, with more colour and clearer and faster diagrams.

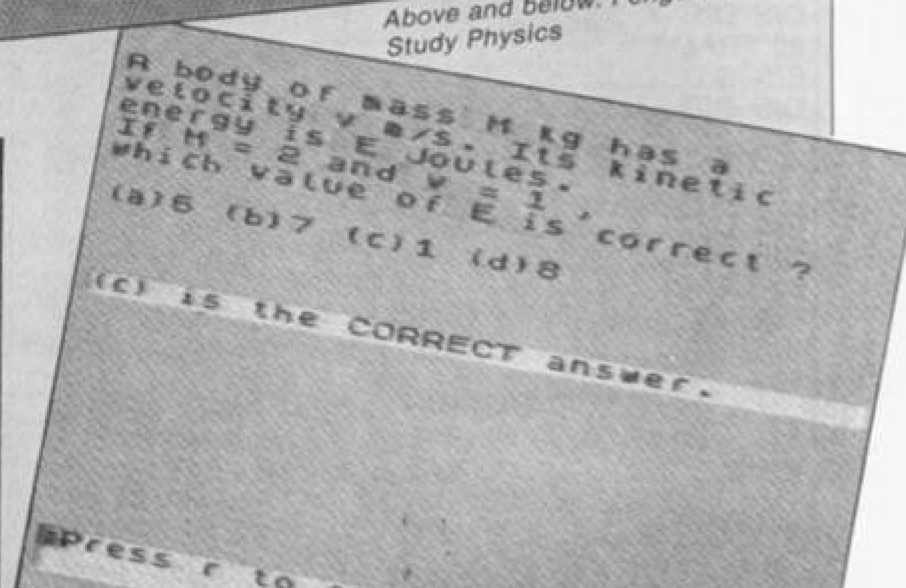
Perhaps this is because the Penguin software has more machine code routines — it's certainly more attractive and much quicker than any of the others. Indeed, too little thought has been given to visual impact in nearly all the programs mentioned here. If someone has a computer the chances are that he or she will have seen countless games of one kind or another, games whose graphics, speed and general presentation put most educational software to shame. The experienced games player is not going to stand for the sort of pathetic "game" presented on Collins's Computer Studies program.

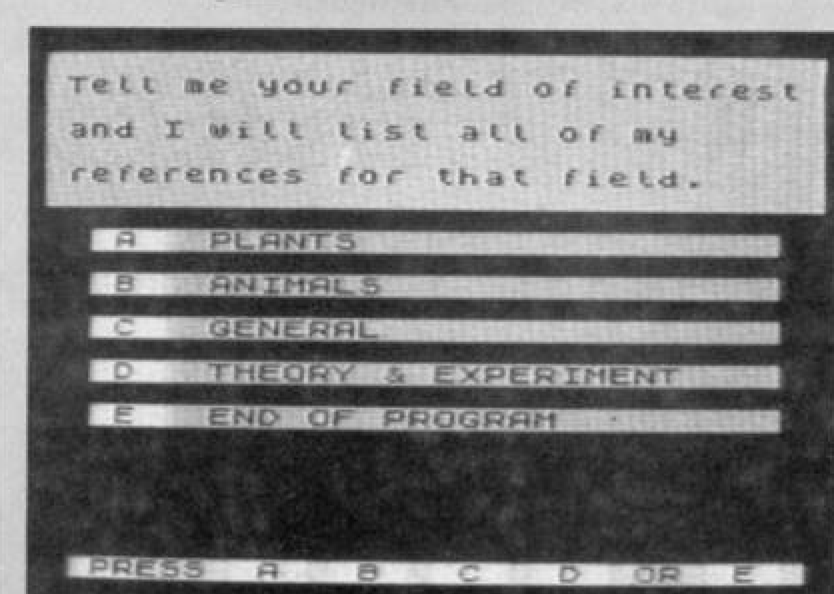
Educationally, none of the programs is without merit. But too many of them do not give the student enough to do and are just not hard enough. And too many of them do not provide anything substantially different from what you would get from a decent set of notes — and if you haven't got those it's unlikely you're going to pass your exams, computer revision or not.

Top of the class, then, comes Penguin for both presentation and content. The other publishers need to pull their fingers out, pull their socks up and get their noses to the grindstone if they want to pass any future exams.



Above and below: Penguin's Study Physics





Left: Longman's biology

MATHS MASTER



Colin Carruthers and a Spectrum teach you a thing or two about quadratic equations.

ARE YOU BORED solving systems of equations with five unknowns? Want a hand to invert a couple of matrices? Shouldn't you check that difficult integration problem you've just spent four hours doing?

Well, the computer's ability to plough through tedious calculations at high speed is used in this program to provide a useful maths package.

The program will run on both the 16K and 48K Spectrums, but since it is written entirely in Basic it should be quite a simple task to implement the package on other micros.

As far as possible, each part of the program has been made self-contained enabling the individual to just type in the routines he or she requires. However, the Matrix Operations section demands that the System of Equations routines be present — this is due to the fact that matrix inversion and solving systems of equations can be done by similar techniques and therefore have common program blocks. In any case, the program must have the menu, input a number and hit any key routines — see figure 1.

Figure 1 Program breakdown.

500- 580 :	Input a number routine. Extensive use is made of this routine, so it is placed near the beginning to speed execution.
1000-1180 :	Menu.
2000-2970 :	System of Equations.
3000-3500 :	Quadratic Equation.
4000-4500 :	Equation of third degree.
6000-6650 :	Matrix Determinant and Inverse.
7000-7500 :	Simpson's Rule.
9000-9030 :	Hit any Key to Return.

There now follows a brief description of each part of the program and examples of the kind of mathematical problem they solve. These examples can be used to check that the routines have been typed in correctly.

System of Equations: Solved using Gaussian Elimination, each problem can have a maximum of five equations and five unknowns. The coefficients are held within a two-dimensional array — called "a". The user is prompted for each coefficient of x in turn, with the whole array of values shown on the screen at all times to enable checking.

Ex (n = 3)

$$\begin{aligned} x_1 + 3x_2 - 4x_3 &= -11 \\ 2x_1 - x_2 + 3x_3 &= 10 \\ 4x_1 + x_2 - 2x_3 &= 3 \end{aligned}$$

(continued on next page)


```
100 GO TO 1000
500 LET a$="": LET dps=0
505 IF integer THEN LET dps=1
510 PRINT AT x,y;a$; INK 4;" "
515 IF INKEY$<>"" THEN GO TO 515
520 LET z$=INKEY$: IF z$="" THEN GO TO 520
525 BEEP .02,34.4: IF LEN a$>=length THEN GO TO 560
530 IF z$="." AND NOT dps THEN LET a$=a$+z$: LET dps=1: GO TO 510
540 IF z$="-" AND a$="" THEN LET a$=z$: GO TO 510
550 IF z$>="0" AND z$<="9" THEN LET a$=a$+z$: GO TO 510
560 IF CODE z$=13 AND a$<>"" AND a$<>"-" THEN PRINT AT x,y;a$;" ": RETURN
565 IF CODE z$=12 AND LEN a$>=1 THEN IF a$(LEN a$)="." THEN LET dps=0
570 IF CODE z$=12 AND LEN a$>=1 THEN LET a$=a$( TO LEN a$-1): GO TO 510
580 BEEP .5,-10: GO TO 510
1000 REM menu
1010 BORDER 0: INK 7: PAPER 0
1020 CLS : POKE 23609,30
1030 PRINT AT 3,3;"1  System of Equations";AT 5,3;"2  Quadratic Equation";AT 7,3;"3  Equation of 3rd Degree";AT 9,3;"4  Matrix Operations";AT 11,3;"5  Simpson's Method"
1035 PRINT AT 13,3;"0  Quit"
1040 PRINT AT 21,3;"Enter Number ->"
1050 LET x=21: LET y=20: LET integer=1: LET length=1
1060 GO SUB 500: IF a$>"5" THEN BEEP .5,-10: GO TO 1060
1065 IF a$="0" THEN STOP
1070 IF a$="1" THEN GO SUB 2000
1075 IF a$="2" THEN GO SUB 3000
1080 IF a$="3" THEN GO SUB 4000
1085 IF a$="4" THEN GO SUB 6000
1090 IF a$="5" THEN GO SUB 7000
1100 RUN
2000 REM simultaneous
2005 LET t$="System of Equations"
2010 LET matrix=0: CLS : PRINT AT 1,3;t$;AT 5,3;"a(11)*x1 + a(12)*x2 .. = b1";AT 6,3;"a(21)*x1 + a(22)*x2 .. = b2"
2019 PRINT AT 7,3;" .  .    .    .    .     ."
2020 PRINT AT 8,3;" .  .    .    .    .     .";AT 9,3;"a(n1)*x1 + a(n2)*x2 .. = bn"
2030 PRINT AT 15,3;"Enter Order n (2-5) -> "
2040 LET x=15: LET y=26: LET integer=1: LET length=1: GO SUB 500
2045 IF a$<"2" OR a$>"5" THEN BEEP .5,-10: GO TO 2040
2050 LET n=VAL a$
2052 LET max=n+1: IF matrix THEN LET max=2*n
2053 DIM a(n,max)
2055 CLS : PRINT AT 0,3;t$
2057 LET y=12: LET integer=0: LET length=5
2058 IF NOT matrix THEN FOR j=1 TO n: PRINT AT 3,6*(j-1);"x";j;: NEXT j
2060 FOR i=1 TO n: FOR j=1 TO n
2062 PRINT AT 2*i+3,6*(j-1);"a(";i;j;")"
2064 NEXT j: IF NOT matrix THEN PRINT AT 2*i+3,6*(j-1);"b";i;
2066 NEXT i
2068 FOR i=1 TO n
2072 LET upper=n+1: IF matrix THEN LET upper=n
2080 FOR j=1 TO upper
2090 IF j<=n THEN PRINT AT 15+j,3;"a(";i;j;") = ": GO TO 2100
2095 PRINT AT 15+j,3;"   b";i;" = "
2100 LET x=15+j: GO SUB 500
2105 LET a(i,j)=VAL a$
2107 NEXT j
2109 FOR c=15 TO 21: PRINT AT c,0;"
            ";: NEXT c
2110 GO SUB 2800: NEXT i
2120 IF matrix THEN GO SUB 6500
2130 IF matrix THEN IF det=0 THEN GO TO 9000
2200 FOR i=1 TO n
2210 LET piv=a(i,i)
2215 IF piv=0 THEN GO TO 2900
2220 FOR j=1 TO max
2230 LET a(i,j)=a(i,j)/piv
2240 NEXT j
2250 FOR k=i+1 TO n
2255 LET piv=a(k,i)
2260 FOR j=i TO max
2270 LET a(k,j)=a(k,j)-piv*a(i,j)
2280 NEXT j
2290 NEXT k
2300 NEXT i
2310 FOR i=n-1 TO 1 STEP -1
2320 FOR j=i+1 TO n
2330 LET piv=a(i,j)
2340 FOR k=i+1 TO max
2350 LET a(i,k)=a(i,k)-piv*a(j,k)
2360 NEXT k
2370 NEXT j
2380 NEXT i
2390 IF NOT matrix THEN FOR i=1 TO n: PRINT AT 15+i,3;"x";i;" = ";a(i,n+1): NEXT i: GO TO 9000
2400 FOR i=1 TO n: FOR j=1 TO n
2410 LET a(i,j)=a(i,j+n)
2420 NEXT j: GO SUB 2800: NEXT i
2425 PRINT : PRINT "Inverse"
2430 GO TO 9000
2800 PRINT AT 2*i+3,0;"
"
2810 FOR k=1 TO upper: IF ABS a(i,k)<0.001 THEN LET a(i,k)=0
2820 LET n$=STR$ a(i,k)+"     ": LET n$=n$( TO 5): IF n$(1)<>"-" THEN LET n$=" "+n$( TO 4)
2830 PRINT AT 2*i+3,6*(k-1);n$: NEXT k: RETURN
2900 LET new=0
2905 IF matrix THEN GO TO 2940
2910 FOR p=i+1 TO n
2920 IF a(p,i)<>0 THEN LET new=p
2930 NEXT p
2940 IF new=0 THEN PRINT AT 16,3;"No Solution": GO TO 9000
2960 FOR m=1 TO n+1: LET temp=a(i,m): LET a(i,m)=a(new,m): LET a(new,m)=temp: NEXT m
2965 LET piv=a(i,i)
2970 GO TO 2220
3000 REM quadratic
3010 CLS : PRINT AT 1,3;"Quadratic Equation";AT 5,3;"Axx + Bx + C = 0"
3020 LET x=9: LET y=7: LET integer=0: LET length=6: PRINT AT 9,3;"A = ": GO SUB 500: LET a=VAL a$
3024 IF a=0 THEN BEEP .5,-10: GO TO 3020
3025 LET x=11: PRINT AT 11,3;"B = ": GO SUB 500: LET b=VAL a$
3030 LET x=13: PRINT AT 13,3;"C = ": GO SUB 500: LET c=VAL a$
3040 LET b=-b/2/a: LET d=b*b-c/a
3050 IF d=0 THEN GO TO 3100
3055 IF d>0 THEN GO TO 3200
3060 LET y=SQR (-d)
3070 PRINT AT 17,3;"Real part: ";b;AT 19,3;"Imaginary: +/- ";y: GO TO 3500
3100 PRINT AT 17,3;"Equal roots: ";b
3110 GO TO 3500
3200 PRINT AT 17,3;"Real: ";b+SQR d;AT 18,3;"Real: ";b-SQR d
3500 GO TO 9000
4000 REM 3rd degree
4010 CLS : PRINT AT 1,3;"Equation of 3rd Degree";AT 5,3;"Axxx + Bxx + Cx + D = 0"
4020 LET x=9: LET y=7: LET integer=0: LET length=6: PRINT AT 9,3;"A = ": GO SUB 500: LET a=VAL a$: IF a=0 THEN BEEP .5,-10: GO TO 4020
4030 LET x=10: PRINT AT x,3;"B = ": GO SUB 500: LET b=VAL a$
4040 LET x=11: PRINT AT x,3;"C = ": GO SUB 500: LET c=VAL a$
4050 LET x=12: PRINT AT x,3;"D = ": GO SUB 500: LET d=VAL a$
4060 LET b=b/a/3: LET c=c/a: LET d=d/a
4070 LET a=c/3-b*b
4080 LET e=d-b*c+2*b*b*b
4090 LET h=4*a*a*a+e*e
4100 IF ABS h<10^-8 THEN GO TO 4300
4105 IF h>0 THEN GO TO 4200
4110 LET f=2*SQR (-a)
4120 LET g=ACS (e/(2*a*SQR (-a)))/3
4125 LET a=ASN 1: LET e=ASN .5
4130 LET c=f*SIN (e-g): LET d=-f*SIN (e+g)
4140 LET i=-f*SIN (e-g)
4150 LET c=c-b: LET d=d-b: LET i=i-b
4160 PRINT AT 16,3;"Real: ";c;AT 17,3;"Real: ";d;AT 18,3;"Real: ";i
4170 GO TO 9000
4200 LET h=SQR h: LET f=.5*(h-e): LET g=-.5*(h+e): LET h=1/3
4210 LET f=ABS f^h*SGN f
4220 LET g=ABS g^h*SGN g: LET h=0.5*SQR 3
4230 PRINT AT 15,3;"Real root: ";f+g-b
4240 PRINT AT 17,3;"Real part: ";-.5*(f+g)-b
4250 PRINT AT 18,3;"Imaginary: +/- ";h*ABS (f-g): GO TO 9000
4300 IF ABS a<10^-8 THEN PRINT AT 16,3;"Triple: ";-b: GO TO 9000
4310 LET f=-ABS (.5*e)^(1/3)*SGN e
4320 PRINT AT 16,3;"Real:        ";2*f-b
4330 PRINT AT 17,3;"Equal root: ";-f-b
4500 GO TO 9000
6000 REM Matrix
6010 CLS : LET matrix=1: LET t$="Matrix Operations"
6020 PRINT AT 1,3;t$;AT 8,3;"a(11)  a(12) .. a(1n)";AT 9,3;"a(21)  a(22) .. a(2n)";AT 10,3;"  .       .
  .";AT 11,3;"a(n1)  a(n2) .. a(nn)"
6025 PRINT AT 4,3;"Inverse and Determinant";AT 5,3;"of nxn Matrix"
6030 GO TO 2030
6500 REM det
6505 FOR i=1 TO n: FOR j=1 TO n
6510 LET a(i,j+n)=a(i,j)
6512 NEXT j: NEXT i
6514 LET det=1
6516 FOR m=n TO 2 STEP -1
6518 LET p=a(m,m+n)
6520 IF p=0 THEN GO TO 6600
6530 FOR i=1 TO m-1
6540 LET q=a(i,m+n)/p
6550 FOR j=1 TO m
6560 LET a(i,j+n)=a(i,j+n)-q*a(m,j+n)
6570 NEXT j
6580 NEXT i
6590 NEXT m
6595 FOR i=1 TO n: LET det=det*a(i,i+n): FOR j=1 TO n: LET a(i,j+n)=0: NEXT j: LET a(i,i+n)=1: NEXT i
6597 PRINT AT 17,3;"Determinant = ";det
6598 IF det=0 THEN PRINT AT 18,3;"-> No Inverse"
6599 RETURN
6600 LET new=0: FOR f=1 TO m-1
6610 IF a(f,m+n)<>0 THEN LET new=f
6620 NEXT f
6630 IF new=0 THEN LET det=0: GO TO 6595
6640 FOR f=1 TO m: LET a(m,f+n)=a(m,f+n)+a(new,f+n): NEXT f
6645 LET p=a(new,m+n)
6650 GO TO 6530
7000 REM simpson's
7010 CLS : PRINT AT 1,3;"Simpson's Method -";AT 3,3;"Approximate integral"
7020 PRINT AT 10,3;"Enter a funtion in x ";AT 12,3;"e.g.    y = 3*x+2"
7030 INPUT "     y = "; LINE f$
7040 PRINT AT 10,3;"                          ";AT 12,3;"
              ";AT 8,9;"y = ";f$
7050 PRINT AT 10,3;"lower x = ": LET integer=0: LET x=10: LET y=13: LET length=8: GO SUB 500: LET d=VAL a$
7060 PRINT AT 12,3;"upper x = ": LET x=12: GO SUB 500: LET e=VAL a$
7065 IF e<=d THEN BEEP .5,-10: GO TO 7060
7070 PRINT AT 14,3;"samples = ": LET x=14: GO SUB 500: LET p=VAL a$
7080 IF p<=0 THEN BEEP .5,-10: GO TO 7070
7090 LET h=(e-d)/2/p
7100 LET a=0: LET x=d: LET y=VAL f$
7110 LET a=a+y: LET x=x+h: LET y=VAL f$
7120 LET a=a+4*y+a: LET x=x+h: LET y=VAL f$
7130 LET a=y+a: LET p=p-1
7140 IF p>0 THEN GO TO 7110
7150 LET c=a*h/3
7160 PRINT AT 17,2;"Integral = ";c
7500 GO TO 9000
9000 LET a$="": IF INKEY$<>"" THEN GO TO 9000
9010 PRINT AT 21,3; INK 4; INVERSE 1;"HIT ANY KEY TO RETURN"
9020 IF INKEY$="" THEN GO TO 9020
9030 BEEP .02,34.4: RETURN
```

(continued from previous page)

This has the solution $x_1 = 2$, $x_2 = -3$ and $x_3 = 1$.

Quadratic equation: The roots are found using the classic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This routine allows for both real and imaginary roots.

Ex 1 $x^2 - 3x + 2 = 0$ gives x = or 2
Ex 2 x^2 6x + 10 = 0 gives x = 3+/−i
Ex 3 $x^2 - 6x + 9 = 0$ gives x = 3 (double root?

Roots of a polynominal

Equation of third degree: This routine gives the roots of a polynominal with a term in x^3. Again, imaginary roots are catered for, giving four types of possible solution.

Ex1 $x^3 - 6x^2 + 11x - 6 = 0$
gives x = 1,2,3
Ex2 $x^3 - 3x^2 - 3x - 1 = 0$
gives x = 1,1,1
Ex3 $-x^3 - 9x^2 + 81x + 729 = 0$
gives x = 9,−9,−9
Ex4 $x^3 - 5x^2 + 7x + 13 = 0$
gives x = −1, 3+/−2i

Matrix Operations: The determinant of the given square matrix is calculated and displayed. Assuming that this is non-zero, the inverse is computed using Gaussian Elimination. A matrix with zero determinant has no inverse. The main "invert" routine is the same as that for the System of Equations.

Ex
(n = 3)

3 1 2
2 1 0
2 1 1

has determinant 1 and inverse

1 1 −2
−2 −1 4
0 −1 1

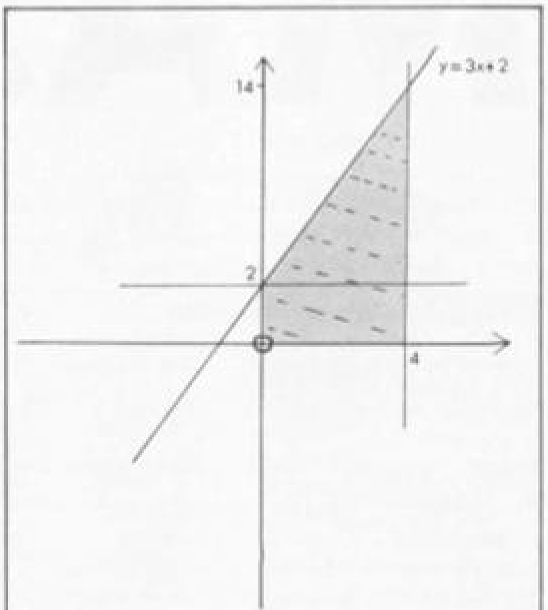


Figure 2. Area of triangle + rectangle.
= ½ x 4 x 10 + 2 x 4
= 20 + 12
= 32

Note that only real matrix elements are allowed.

Simpson's Rule: The function entered must be a valid expression in 'x', for example 'y = 3x+2' must be entered as:

y = 3*x+2

Also, functions such as Sin, Tan or Ln must be entered as single-stroke key words. Any invalid expression typed in response to the prompt will result in an error at line 7100, statement 3. If this should happen, simply type:

GO TO 7000

and re-type the expression correctly.

Ex
y = 3*x+2
lower x = 0
upper x = 4
samples = 10

Value of the integral

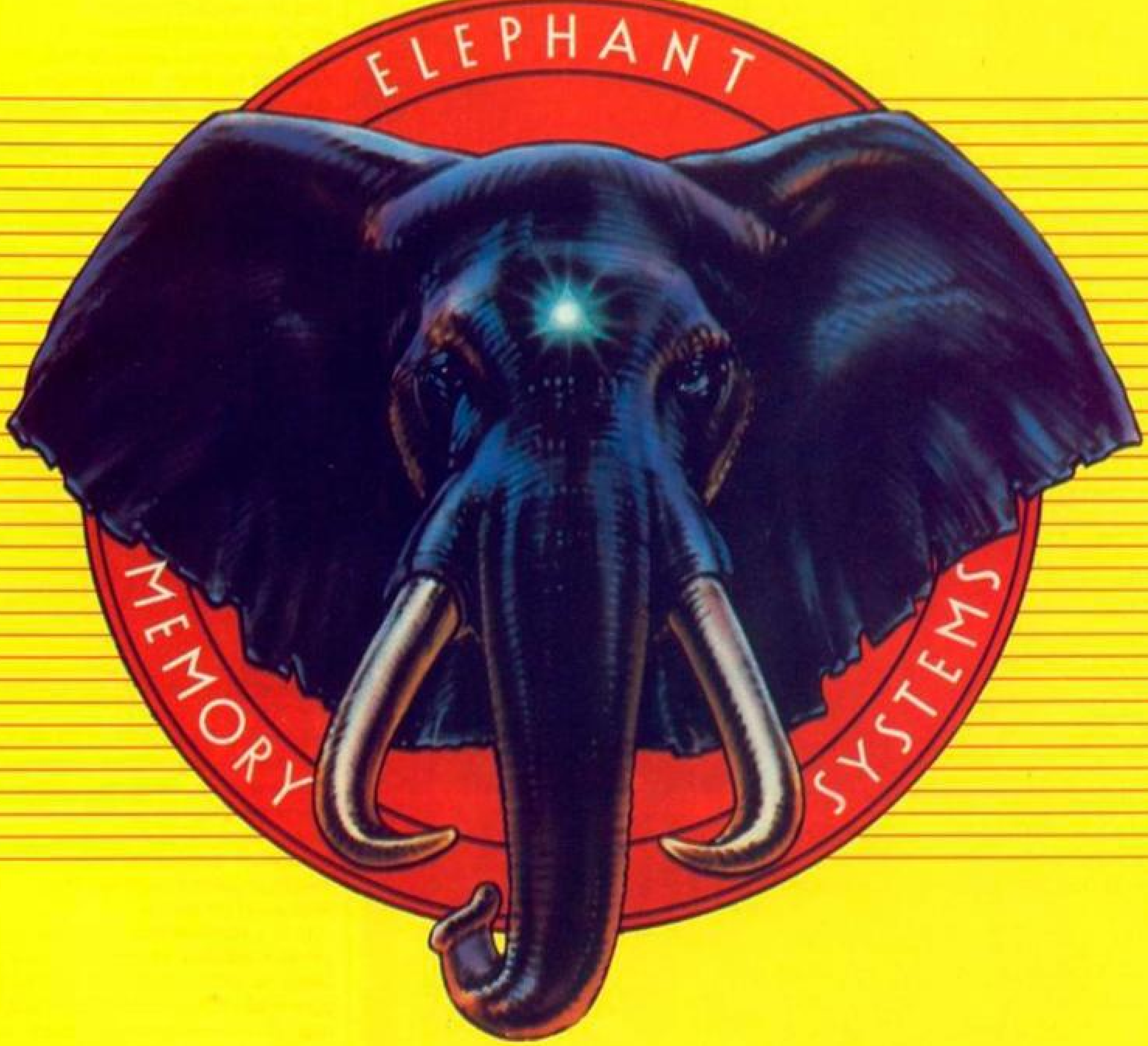
As can be seen by looking at figure 2, the value of the integral — or shaded part of the graph — should be 32.

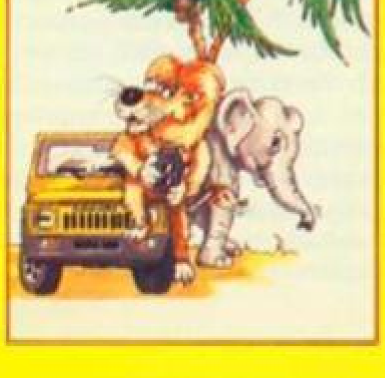
Type in the program as it is listed and check the operation of each segment using the given examples. They have been chosen to test all parts of the program and should make any typing errors apparent. When all is well, save the package by typing:

CLEAR: SAVE "Maths" LINE 100

This prevents any variables being dumped along with the program. ∎

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AMSTRAD AND SPE[C]

LANDSCA[PE]

Fill in the background to that text-only adventure. Artist Brian James puts pixel to phosphor.

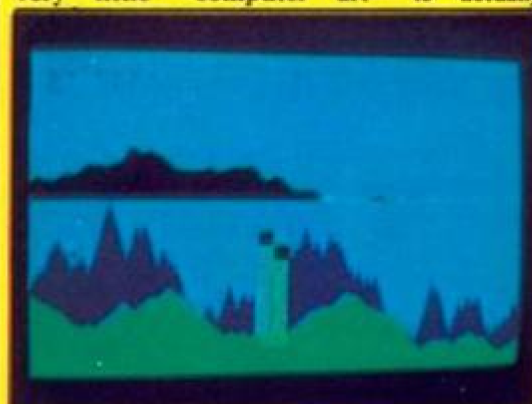
Program 1.

```
10 '        Fourier Synthesis
20 '
30 '          AMSTRAD BASIC
40 '
50 '      Brian James ,  March 1985
60 '
70 c$=CHR$(13)
90 KEY 135,"mode 1:ink 0,1:ink 1,24"+c$+" list "
100 KEY 137," edit ": KEY 128," goto "
120 SPEED KEY 12,2
130 SPEED WRITE 1
170 '
180 DIM a(250),b(250),c(250)
185 '
190 MODE 0          ' for 16 colours
200 nn=6            ' number of terms
210 am=30           ' maximum amplitude
220 INK 0,11        ' blue sky
230 '
240 FOR i= 1 TO 15
250 INK i,RND*26     ' set colours
260 NEXT
270 '
280 FOR n= 1 TO nn  ' Each wavelength
290 a(n)=RND*80/n    ' amplitudes
300 b(n)=RND*2*PI    ' phases
310 c(n)= RND*15      ' colours
320 NEXT
325 PRINT: PRINT" Fourier Synthesis"
330 '
340 FOR x=0 TO 639 STEP 4
350 PLOT x,0,0         ' at bottom
360 y=10
370 k=2*PI*x/640
380 '
390 FOR n= 1 TO nn   'incr. frequencies
400 y=y+a(n)*(1+SIN(n*k+b(n))) 'add waves
410 DRAW x,y,c(n)   ' draw upwards
420 NEXT n
430 '
440 NEXT x           '  go right
450 '
460 FOR i= 1 TO 3000:NEXT   'pause
470 RUN
500 '
6000 WHILE 1:SAVE "":WEND
```

THE LANDSCAPE Creator is a program which creates detailed coloured landscape views, quickly and spontaneously. I developed this idea first on the Spectrum 48K, and now the program has been redesigned to fully exploit the beautiful graphics capability of the Amstrad CPC-464.

It is a simulation of "creativity": the computer makes all decisions relating to a wide range of parameters concerning the hills, trees, flowers, lakes, islands, and buildings. The number of variable parameters is such that the resulting scene gives endless, unexpected surprises with a wide range of possible colour schemes.

I developed this idea because, generally, very little "computer art" is actually



The scenic Spectrum.

generated by the computer. In nearly all cases the computer merely displays the picture, which is arranged by the programmer. We now have graphics packages which make it much easier for the operator to control the results on the screen. However, the result could just as well — or even better — be done with paint on canvas.

It is a much more interesting challenge to get the machine to create its own pictures, based on a "knowledge" of the subject to be portrayed. This involves intricate mathematical modelling, and really begins to unleash the power and the intelligence of the microchip and do things in a way only the computer can.

We have all seen some impressive colour graphics in computer games. In most cases these graphics make extensive use of user defined characters, which are rectangular elements — usually 8 by 8 pixels — used as building bricks. In contrast to this, the use of mathematical functions and probability theory allows us enormously improved flexibility, enabling the spontaneous creation of different scenes, giving endless surprises, even to the programmer!

It is easy enough to write a program to rearrange a number of graphic shapes — say to

ECTRUM

APES

select a building from a choice of five, choose a mountain from a choice of five, etc. etc. and put them together. But to simulate the idea of "creativity", we need to use a whole hierarchy of routines, building up the picture from the smallest elements, with freedom of choice at every stage in the process. User-defined characters are of limited use in this kind of exercise.

My objective in the Landscape Creator was to have the minimum of fixed quantities: to allow the greatest freedom for variations, without departing from some basic properties of landscapes. This same idea I used in Country Cottages, a fun game for two players where you buy cottages and try your skill in managing the awful tenants.

The cottages, the landscapes and the tenants are different every time you play the game. However, the Landscape Creator was designed from scratch, to produce greater variations, better colour schemes, better appearance of water and vegetation.

The number of calculations involved is quite horrendous. Just doing a single pixel involves over 50 machine-code instructions. Though Amstrad Basic is very comprehensive and quite fast, the Landscape Creator has so many calculations to do that machine code was essential.

Routines for plotting

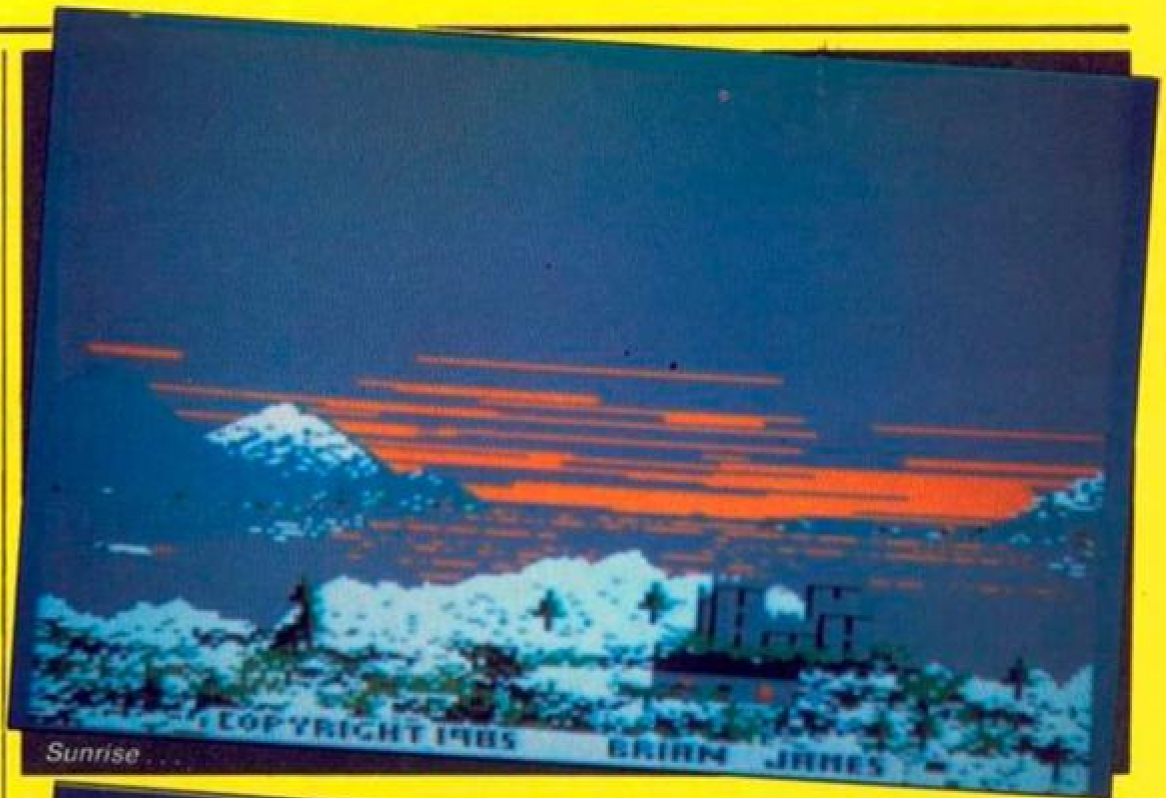
The Amstrad Firmware manual gives the addresses of inbuilt machine-code routines for plotting. These are easy to use and nicely crashproofed — but are therefore not as fast as would be desired. The Landscape Creator utilises its own extremely fast, compact plotting routines. Also the basic arithmetic routines were designed for the job.

In the Landscape Creator, the object was to have the maximum variety of pictures. Whether it is creating a rugged skyline, an island, a patch of buttercups, or a castle, a flexible routine is used which combines probability functions with appropriate mathematics.

The program needs some "knowledge" about the structure of landscapes, so that the different features will have reasonable shapes and fit sensibly together. Trees and buildings must not hang in mid-air; hills must not have enormous holes through them; land must not be drawn when it is below water! Foreground objects may hide more distant objects — not the reverse — and so on. Distant hills could have a grey or bluish colour; whereas the foreground can have much brighter colours.

Lakes and sea can use a mixture of colours

(continued on next page)



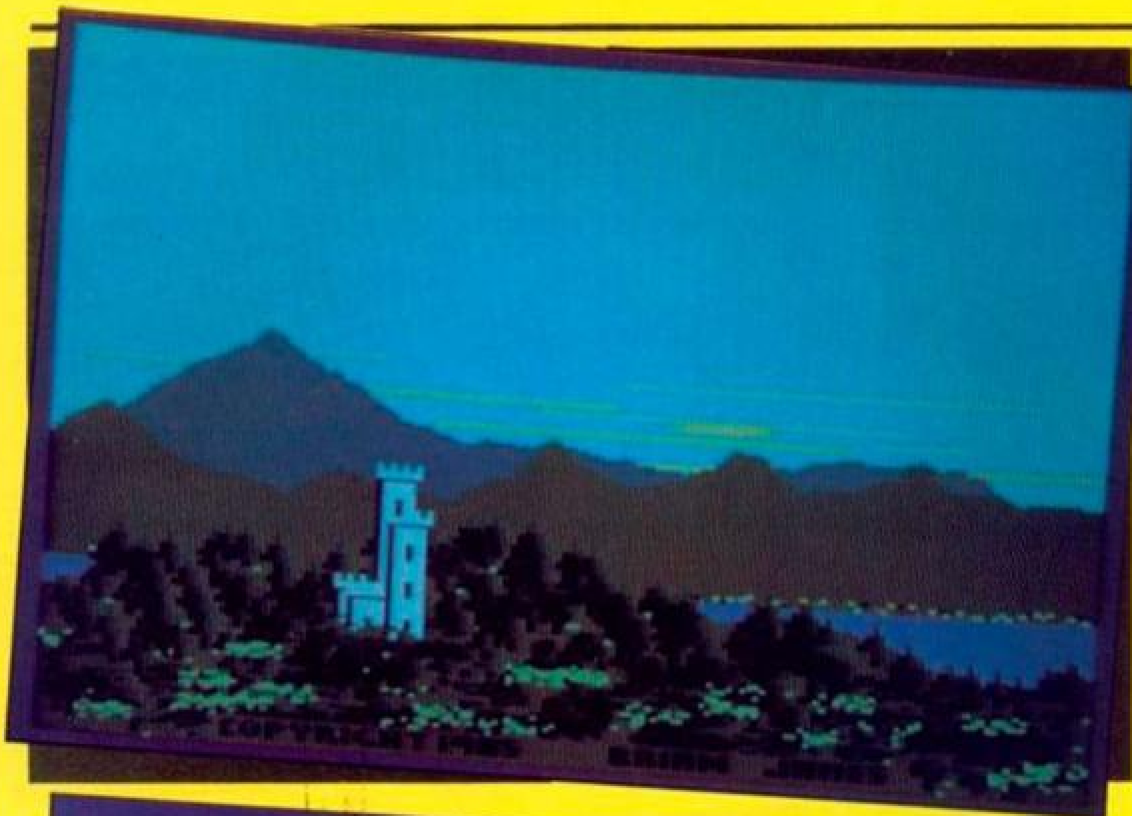
Sunrise . . .

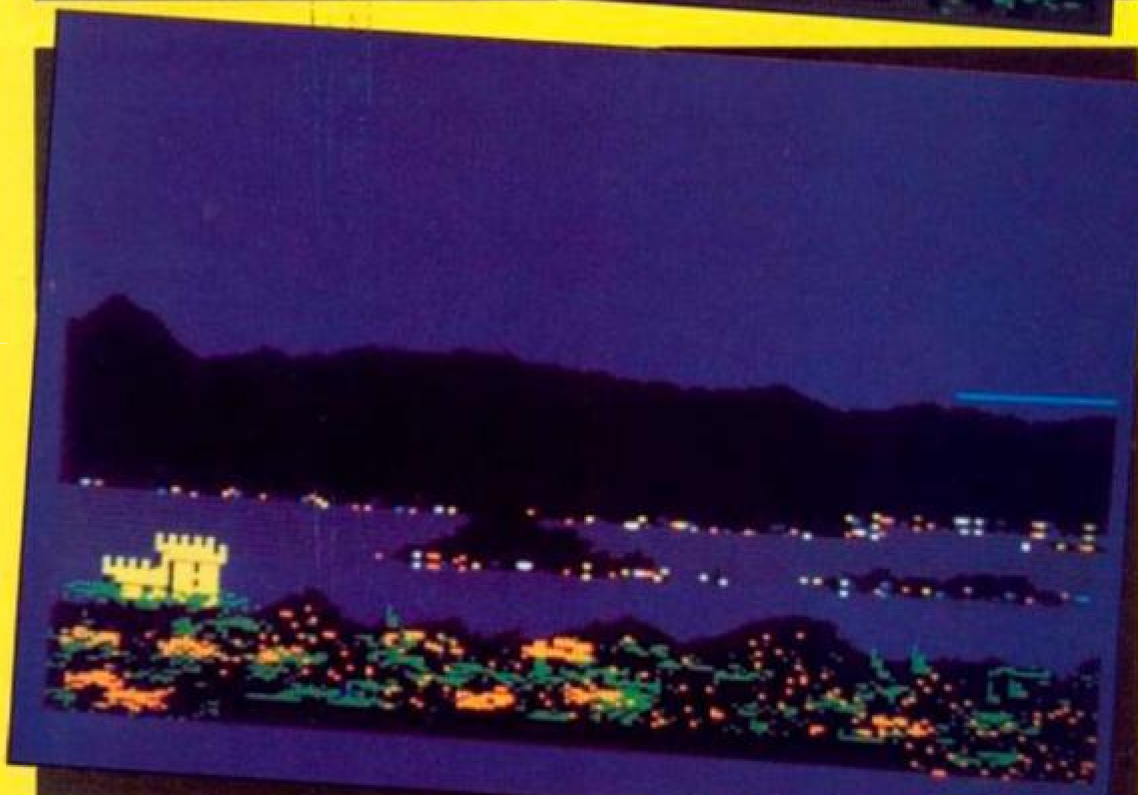


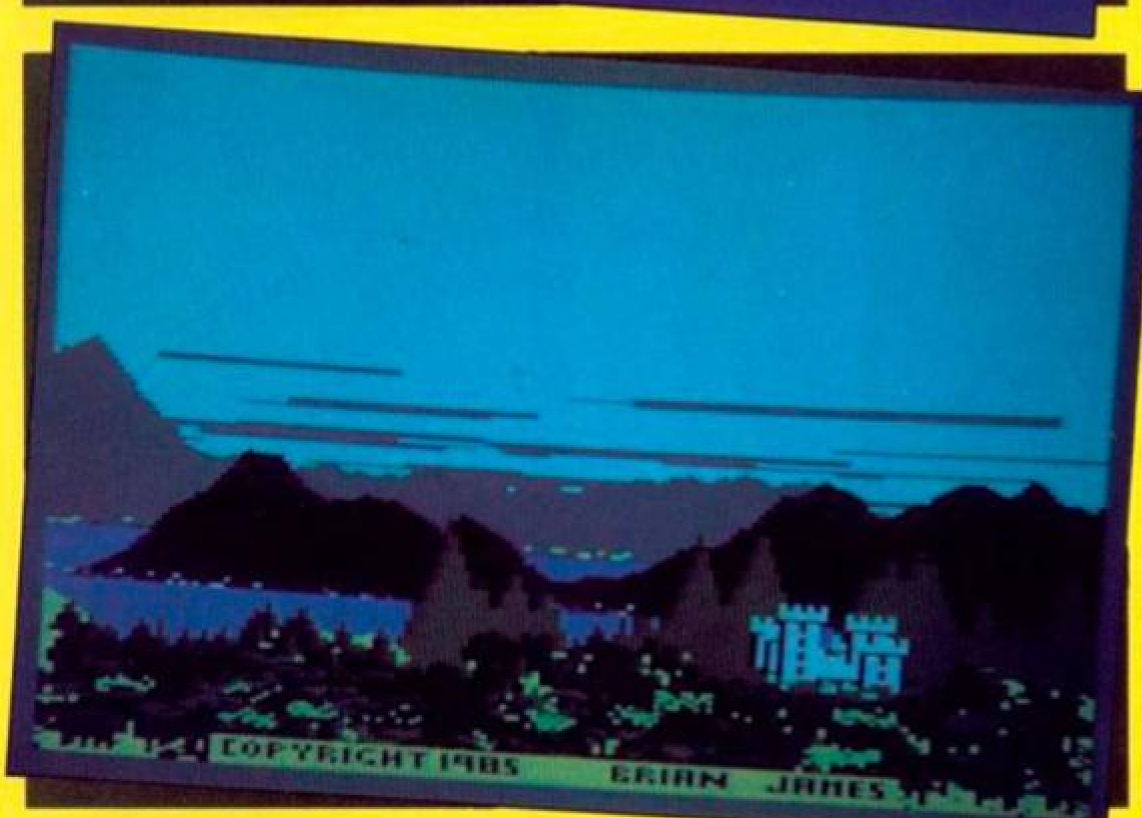
. . . day . . .



. . . sunset.







(continued from previous page)

reflecting the hills and sky beyond. The precise formulation of the fundamental properties of a landscape is a subjective process — and this is where the art comes in — and the inspiration for this task came from the Highlands of Scotland and also Cumbria.

The Amstrad version of the program displays several advances compared to the Spectrum version. A tremendous advantage of Amstrad graphics is that any pixel can be any colour. You can have 16 colours in Mode 0, with a resolution of 160 pixels horizontally by 200 vertically. For better resolution, Mode 1 gives you 320 horizontally, but only four colours. I chose Mode 0 with its much greater range of colours. If you want better resolution horizontally than vertically, then you could turn the monitor on its side, and swap your x and y axes.

Pixels can be any colour

Whatever mode you select, any pixel can be any of the available colours. This gives enormous freedom compared to most home computers. Foreground features can be drawn with no effect at all on the background colours. The colours actually used on the screen can be chosen from a selection of 27.

Machine code is notoriously difficult to experiment with and so I am providing a simple program in Amstrad Basic for you to try out. It uses the RND function to generate



a recipe for a mixture of sine waves with different wavelengths and phrases. The sum of all the different waves is a complex curve which can have enormous variability. It is a well-known method called Fourier Synthesis.

Each waveform here is drawn with a different colour and — Hey Presto! — the Fourier Series we learned in stuffy lecture theatres comes to life in brilliant colours.

The number of sine waves used in nn. You can try putting in a larger number, say nn = 20 or nn = 50. The curve becomes more and more complex — but very much slower. This method is very good for smooth curves, but becomes too cumbersome and slow for very rough crinkly lines.

Next month we will explore more possibilities with the RND function, and also peer into the fascinating world of "fractals", functions which are particularly suitable for describing the very rough mountain skylines we like to gaze upon.

I can supply the Landscape Creator doubly recorded on cassette, for the Amstrad or the Spectrum 48K. Send £5 for the Amstrad version, or £3 for the Spectrum version, to — Brian James, 21 Lamond Place, Aberdeen AB2 3UT. ■

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JOE AND THE ALLIGATORS

F G Tout and his CBM-64 are on the run.



Variables.
V — 53248 sprites
Q — sp locations
CO — colour of water level and time limit
TL — time limit
WL — water level
L — joystick port
S1, S2, S3 — sound
SYS 36864 = sound on
SYS 37120 = sound off
LI — lives
LE — lake number
SC — score

YOU ARE Joe, out for a quiet boat ride at your favourite beauty spot when you suddenly realise that someone with a warped sense of humour has sent loose a shoal of dangerous and ferocious aligators, intent on making you their snack of the day.

Guide Joe through four waves trying to steer clear of floating logs, other boats, rafts, floating weed and most of all *watch those 'gators.*

When you reach the narrow exit you have to guide Joe through the locks without hitting the walls or overhanging rocks.

There is also a hole in the boat and you must use the fire/button to bale out or the boat will sink.

Time limit and water level are shown at the bottom of the screen:

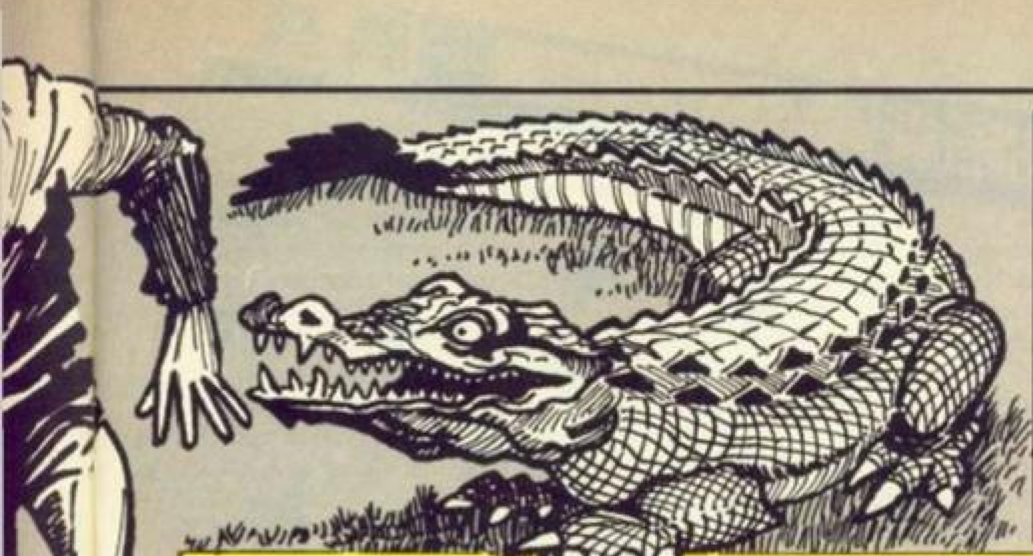
Time — WHITE
Water level — BLUE

On the locks screen you can control Joe by:

Left — reduce speed of boat
Right — increase speed of boat
Up — increase level of water

Listing 1.

```
10 PRINT"[CLR]":FORT=0TO2:FORX=0TO255:READA:IFA=-1THEN40
20 POKE36864+T*256+X,A:NEXTX
40 NEXTT
50 DATA169,146,141,21,3,169,0,141,20,3,96,-1
60 DATA169,234,141,21,3,169,49,141,20,3,96,-1
70 DATA172,0,147,192,16,240,57,206,1,147,173,1,147,201,0,208,44,230,0,147,169
80 DATA0,141,4,212,169,31,141,5,212,169,0,141,6,212,169,17,141,4,212,185,0,147
90 DATA185,0,148,141,1,212,185,0,149,141,0,212,185,0,150,141,1,147,76,49,234
100 DATA169,0,141,0,147,141,4,212,24,144,242,-1
110 POKE37632,0:POKE37633,0:FORT=0TO62:READHF,LF,D
130 POKE37888+T,HF:POKE38144+T,LF:POKE38400+T,D:NEXTT
135 POKE38144+T,22:POKE38150+T,227:POKE38400+T,100:POKE37388,T+1
140 DATA25,177,30,25,177,30,32,94,30,20,214,30,25,177,30,22,227,30,22,227,30
145 DATA20,214,30,25,177,30,22,227,20,17,37,30,19,63,30,21,154,30,22,227,30
150 DATA21,154,30,22,227,30,25,177,40,20,214,20,22,227,100,0,0,20,25,177,30
155 DATA25,177,30,32,94,30,20,214,30,25,177,30,22,227,30,22,227,30,20,214,20
160 DATA25,177,30,22,227,30,17,37,30,19,63,30,21,154,30,22,227,30,21,154,30
165 DATA22,227,30,25,177,20,20,214,20,22,227,100,30,126,20,20,126,20,34,75,30
170 DATA25,177,30,22,227,30,25,177,30,20,214,30,32,94,30,34,75,30,43,52,30
175 DATA43,52,30,43,52,20,30,126,20,25,177,30,20,214,30,22,227,30,25,177,30
180 DATA20,214,30,25,177,30,22,227,30,21,154,30,19,63,30,17,37,20,25,177,30
185 DATA25,177,30,32,94,30,20,214,40,25,177,30,22,227,30,22,227,40,20,214,30
190 DATA25,177,30,22,227,20,17,32,30,19,63,20,21,154,30,22,227,20,21,154,30
200 DATA22,227,30,25,177,30,20,214,30,22,227,30,22,227,30,22,227,200
29999 FORI=0TO1215:READA:POKE28864+I,A:NEXT
30000 FORI=0TO63:READA:POKE(244*64)+I,A:NEXT
30001 DATA40,0,0,22,40,0,213,204,0,197,0,0,49,67,0,0,80,0,0,20,0
30004 DATA0,166,160,2,254,186,11,218,126,43,214,126,43,214,126,11,218,126,2
30007 DATA254,186,0,166,160,0,20,0,0,80,0,49,64,0,197,3,12,21,48,240,212,0,0,0
30011 DATA0,63,0,0,196,192,0,55,0,0,4,0,0,4,0,0,4,0,0,4,0
30014 DATA0,166,160,2,254,186,11
30015 DATA186,126,43,90,126,43,90
30016 DATA126,11,186,126,2,254,186
30017 DATA0,166,160,0,4,0,0,4,0,0,4,0,0,55,0,0,196,192,0,63,0,0
30021 DATA0,0,192,0,3,5,0,0,21,0,0,20,0,0,83,0,1,76,0,5,0
30024 DATA0,166,160,3,254,186,13
30025 DATA170,126,45,186,126,45,186
30026 DATA126,13,170,126,3,254,186
30027 DATA0,166,160,0,5,12,0,1,112,0,0,83,0,3,20,0,0,213,0,0,5,0
30050 DATA0,0,192,0,3,20,0,0,84,0,0,83,0,1,76,0,5,0,0,20,0,42,154,0,174,191
30060 DATA128,190,171,224,189,167,232,189,167,232,190,171,224,174,191,128,42
30065 DATA154,0,0,20,0,0,5,12,0,1,64,0,12,83,0,3,84,0,0,20,0
30070 DATA0,0,0,0,252,0,3,19,0,0,220,0,0,16,0,0,16,0,0,16,0,42,154,0,174,191
30080 DATA192,190,170,224,189,169,232,189,169,232,190,170,224,174,191,192
30090 DATA42,154,0,0,16,0,0,16,0,0,16,0,0,220,0,3,19,0,0,252,0,0
31011 DATA12,0,0,80,192,0,87
31012 DATA0,0,20,0,0,197,0
31013 DATA0,49,64,0,0,80,0
31014 DATA42,154,0,174,191,192,190
31015 DATA170,112,189,169,120,189,169
31016 DATA120,190,170,112,174,191,192
31017 DATA42,154,0,0,80,0,49
31018 DATA64,0,197,0,0,20,192
31019 DATA0,87,0,0,80,48,0,0
50001 DATA0,0,0,0,0,0,20,0,0,12,0,24,12,0,140,6,0,112,7,1,224
50003 DATA3,191,192,3,255,200,31,255,236,63,255,255,127,255,255,255,255,236,195
50007 DATA255,200,3,191,192,1,195,128,0
50009 DATA195,0,0,102,0,0,60,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,0,3,0,64,3,0
51003 DATA192,3,129,192,3,129,192,3,191,192,3,255,200,31,255,236,255,255,255
51006 DATA255,255,255,63,255,236,3,255,200,3,191,192,3,131,129,3
51009 DATA129,129,3,1,128,2,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,124,0,0,199
52003 DATA0,1,131,128,3,129,192,131,191,192,227,255,200,255,255,236,127,255
52006 DATA255,63,255,255,31,255,236,3,255,200
52007 DATA7,191,192,15,3,128,20,1,192,48,0,96,64,0,48,0,0,24,0,0,0,0
53001 DATA0,0,0,0,0,0,0
53002 DATA0,0,192,0,0,48,0
53003 DATA0,12,0,0,197,84,0
53004 DATA21,149,64,90,233,84,106
53005 DATA86,149,190,183,218,190,183
53006 DATA218,106,86,149,90,233,84
53007 DATA21,149,64,197,84,0,12
53008 DATA0,0,48,0,0,192,0
53009 DATA0,0,0,0,0,0,0,0
54001 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0
54003 DATA0,20,0,0,21,80,0
54004 DATA21,86,160,2,175,250,10
54005 DATA189,190,42,189,126,42,189
54006 DATA126,10,189,190,2,175,250
54007 DATA21,86,160,21,80,0,20
54009 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54011 DATA0,51,48,0,12,240,0
54012 DATA243,12,0,12,240,0,51
54013 DATA0,20,12,192,21,83,192
54014 DATA21,87,240,2,173,254,10
54015 DATA189,126,42,189,122,42,189
54016 DATA250,10,191,234,2,175,170
54017 DATA21,86,160,21,80,0,20
54018 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0
54020 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,0,40,11,0,10,47
54022 DATA64,42,175,80,14,175,80,14,47,64,14,11,192,50
54024 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54026 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54028 DATA64,2,175,80,2,175,80,2,15,64,14,3,192,10,0,0,40,0,0,0,0
54030 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54032 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,15
54034 DATA64,10,15,80,0,15,80,0,15,64,0,3,192,0
54036 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
54101 DATA0,0,0,0,136,192,0,204,0,3,204,48,0,204,0,0,252,12,12,168,0
54104 DATA0,252,3,48,252,16,3,255,200,195,87,195,3,87,0,15,16,48,204,16,0
54107 DATA13,0,0,1,0,192,48
54108 DATA0,0,0,0,0,0,195,0,0,0,0,0,48,0,0,0,0,0,0,0,136,0,0
54112 DATA204,192,0,204,0,3,204
54113 DATA48,0,252,0,12,168,12
54114 DATA0,252,0,200,252,3,31
54115 DATA252,0,15,87,0,195,87
54116 DATA0,0,19,195,0,16,192
54117 DATA48,1,192,0,1,0,0,0,12,12,0,0,0,0,192,0,204,0,0,48,0,0
54201 DATA0,0,0,0,0,0,0
54202 DATA0,0,0,0,0,4,0
54203 DATA16,30,170,154,166,170,152
54204 DATA4,0,16,166,170,152,30
54205 DATA170,154,4,0,16,166,235
54206 DATA154,39,215,216,7,215,208
54207 DATA30,235,152,166,170,154,4
54208 DATA0,16,30,170,152,6,170
54209 DATA144,4,0,16,0,0,0,0
54301 DATA0,0,129,1,0,134,2
54302 DATA3,0,14,132,0,51,20
54303 DATA4,4,0,4,35,12,9
54304 DATA81,194,50,146,86,66,12
54305 DATA189,140,0,246,16,3,124
54306 DATA17,156,147,90,80,164,132
54307 DATA35,184,132,4,80,72,4
54308 DATA144,232,24,145,48,33,9
54309 DATA0,32,4,120,0,4,0,0
54401 DATA0,0,0,0,0,0,0
54402 DATA0,0,0,0,0,0,0
54403 DATA0,0,0,1,128,0
54404 DATA1,128,0,3,224,0,3
54405 DATA240,0,3,216,0,255,255
54406 DATA255,192,252,14,127,255,240
54407 DATA127,255,240,0,0,0,0
54408 DATA0,0,0,0,0,0,0
54409 DATA0,0,0,0,0,0,0,0
55000 FORI=0TO255+128:READA:POKE245*64+I,A:NEXT
55010 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,64,0,1,213,170,151,191
55020 DATA85,126,42,255,235,63,170,189,5,255,244,3,92,208
55030 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
55040 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,0,236,0,0,100
55050 DATA0,2,172,0,2,164,0,0,252,0,0,252,0,0,252,0,0,204,0,0,204,0,0,204,0,0
55060 DATA136,0,0,60,0,0,136,0,2,100,0,0
55070 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,2,236,0,2,164,0
.0
55080 DATA174,0,0,102,0,0,252,0,15,252,0,15,252,0,4,12,0,0,12,0,4,15,0,40,6,0,0,
2
55090 DATA0,0,1,0,0,10,0,0
55100 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,2,252,0,2,116,0,0,174,0,0,166,0
.0
55110 DATA252,0,0,100,0,0,252,0,0,252,0,3,252,0,11,204,0,43,15,0,40,15,128,160,3
55120 DATA160,0,0,160,0,0,32,0,0,160,0
55130 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,0,172,0,0,164,0
.0
55140 DATA100,0,2,164,0,2,252,0,0,252,0,0,252,0,0,204,0,3,207,0,3,207,128,10,3
55150 DATA160,0,0,160,40,0,32,160,0,160,0
55160 DATA0,252,0,0,124,0,2,172,0,0,172,0,0,16,0,0,252,0,0,116,0,0,172,0,0,164
55170 DATA0,0,100,0,2,164,0,2,252,0,0,252,0,0,252,0,0,204,0,3,206,128,3,206,128
55180 DATA2,0,128,10,0,128,0,0,0,40,0,0,0
61000 POKE53280,6
62000 FORI=0TO48:READA:POKE49900+I,A:NEXT
62010 DATA234,169,40,133,250,169,4,133,251,162,128,160,0,138,145,250,200,192
62020 DATA40,208,249,232,165,250,24,105,40,133,250,165,251,105,0,133,251
62030 DATA224,152,208,228,96,0
62050 POKE53280,0:POKE53281,11:T=0:POKE56334,PEEK(56334)AND254:POKE1,PEEK(1)AND2
51
62055 FORQ=0TO6400:POKE14336+Q,PEEK(53248+Q):NEXT:POKE1,PEEK(1)OR4:POKE56334,PEE
K(56334)OR1
62060 READAQ:T=T+1:IFAQ<>-1THENPOKE14336+Q+T,AQ:GOTO62060
62065 FORI=0TO600STEP8:A=14336+I+1:B=PEEK(A):POKEA,BAND6:NEXT
62070 DATA0,0,0,0,0,0,63,63,120,199,255,124,35,63
62075 DATA192,255,15,240,255,3,255,224,0,195,255,15,243,63,231,0
62080 DATA30,60,255,31,231,255,239,0,136,221,255,255,255,255,255,255
62085 DATA255,255,255,255,255,255,123,34,86,105,253,237,253,117,86,85
62090 DATA255,255,255,255,255,255,255,255
62095 DATA127,255,63,127,31,63,127,255,254,252,248,252,254,255,254,252
62100 DATA27,27,219,216,216,219,195,195,219,219,195,195,27,27,216,216
62105 DATA36,42,20,0,0,20,42,36
62110 DATA63,127,63,255,127,63,93,0,254,255,253,254,253,255,176,136
62115 DATA0,44,190,255,253,254,255,254,34,51,119,63,255,31,63,127
62120 DATA0,12,190,225,127,190,12,0
62125 DATA1,11,7,47,31,191,127,255,255,127,63,95,15,23,3,5
62130 DATA20,62,255,255,255,255,255,255
62135 DATA251,251,0,223,223,0,247,247,242,249,249,49,3,199,231,227
62140 DATA183,183,183,219,221,221,237,237,255,15,240,255,31,231,249,255
62150 DATA-1
62155 FORI=0TO319:READA:POKE251*64+I,A:NEXT
62160 DATA131,255,128,183,255,224,63,224,240,31,192,126,63,128,126,126,192,127
62165 DATA126,32,61,255,0,23,255,0,15,255,0,0,255,0,0,255,14,0,255,7,240,255,19
62170 DATA251,255,97,252,255,192,20,127,128,20,63,192,20,63,255,252,111,255
62175 DATA240,131,255,240,0
62180 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,32,0,48,16,124,96,25,255,192,15
62185 DATA255,128,7,255,192,15,255,192,15,143,192,30,219,192,20,115,192,20,3
62190 DATA190,20,225,204,15,185,240,15,255,240,7,185,240,0,224,224,0
62195 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
62200 DATA112,0,3,254,0,3,254,0,0,112,0,0,240,0,0,160,0,0,240,0,0,240,0,0
62205 DATA120,0,255,0,3,158,0,0,250,0,0,252,64,0,249,192,0,127
62210 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,4,0,0,1,30,16,0,255,160,0,255,192
62215 DATA1,255,224,3,220,240,3,191,112,3,146,112,3,128,112
62220 DATA3,128,48,1,190,48,0,235,160,0,127,192,0,59,128,0,141,0,0
62225 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
62230 DATA7,0,0,111,240,0,63,232,0,30,80,0,31,56,0
62235 DATA29,128,0,62,128,0,62,0,0,62,0,0,127,0,0,156,128,0,28,0,0,0,0,0,0,0,0
```



Gator: Listing 1.

10 - 200 Music interupt & data
29999-61000 Sprite data
62000-62030 Download W.D.Gs
62155-62235 Sprites for Title
62300-62570 Move sprites.

Gator: Listing 2.

0 - 50 Set variables
100 - 135 Set sprites pos.
600 - 999 Set time and water level
1000- 1099 Main routine
10000-10199 Screen 1
11000-11099 Screen 2
11100-11199 Screen 3
11200-11288 Screen 4
22000-22040 Lives left
23000-23155 Game over
30000-30199 Locks screen
60000-60998 Title page
60999-61199 Music for title page

```
62300 FORI=0TO255:READA:POKE49152+I,A:NEXT
62310 DATA162,0,189,0,200,24,105,5,157,0,200,201,240,157,0,200,96
62320 DATA162,0,189,0,200,24,233,5,157,0,200,201,240,157,0,200,96
62330 DATA162,0,189,1,200,24,233,5,157,1,200,201,240,157,1,200,96
62340 DATA162,0,189,1,200,24,105,5,157,1,200,201,240,157,1,200,96
62350 DATA162,0,189,240,7,24,105,1,201,200,144,2,169,205,157,240,7,232,224
62355 DATA1,200,236,96
62360 DATA162,0,189,240,7,24,105,1,201,211,144,2,169,200,157,240,7,232,224
62365 DATA1,200,236,96
62370 DATA162,2,189,0,200,24,105,1,157,0,200,201,240,157,0,200,96
62375 DATA162,4,189,0,200,24,105,2,157,1,200,201,240,157,0,200,96
62380 DATA162,6,189,1,200,24,233,3,157,0,200,201,240,157,1,200,96
62385 DATA162,8,189,1,200,24,105,4,157,1,200,201,240,157,1,200,96
62390 DATA162,11,189,0,200,24,105,1,157,1,200,201,240,157,0,200,96
62395 DATA162,13,189,0,200,24,233,2,157,1,200,201,240,157,0,200,96
62400 DATA162,14,189,1,200,24,233,2,157,0,200,201,240,157,1,200,96
62410 DATA162,2,189,240,7,24,105,1,201,214,144,2,169,211,157,240,7,232
62420 DATA224,8,200,236,96
62500 FORI=0TO9:READA:POKE49500+I,A:NEXT
62510 FORI=0TO30:READA:POKE49520+I,A:NEXT
62520 DATA173,0,220,32,112,193,32,36,194,96
62530 DATA201,126,208,4,32,34,192,96,201,125,208,4,32,51,192,96,201,123,208,7,32
62540 DATA17,192,32,68,192,96,201,119,208,7,32,0,192,32,91,192,96,96
62550 FORI=0TO24:READA:POKE49700+I,A:NEXT
62560 DATA32,114,192,32,131,192,32,148,192,32,165,192,32,182,192,32,199
62570 DATA192,32,216,192,32,233,192,96
63000 POKE198,2:POKE631,13:LOAD
```

Listing 2.

```
0 S1=54276:S2=54277:S3=54273:FORI=S1-4TOS1+20:POKEI,0:NEXT:POKES1+20,15:GOTO6000
0
1 S1=54276:S2=54277:S3=54273:FORI=S1-4TOS1+20:POKEI,0:NEXT:POKES1+20,15
10 A$="[illegible]":POKE53272,31
15 B$="[illegible]"
20 C$="[illegible]"
25 D$="[illegible]"
30 E$="[illegible]"
35 F$="[illegible]"
40 G$="[illegible]"
50 H$="[illegible]"
100 V=53248:Q=205:POKEV+21,255:POKEV+28,3:POKEV+37,10:POKEV+38,14:LI=5:SC=0
120 POKEV+39,1:R=0:DEFFNA(A)=(PEEK(V+30)AND1):DEFFNB(B)=(PEEK(V+31)AND1)
130 FORI=40TO46:POKEV+I,12:NEXT:POKEV+3,100:POKEV+8,100:POKEV+9,200:POKEV+10,150
135 POKEV+11,135:POKEV+27,254:POKEV+29,2:POKEV+40,1:CO=54272
500 A0=49500:POKEV+30,0:POKEV+31,0:GOTO10000
600 FORI=1944TO1983:POKEI,72:POKEI+CO,1:NEXT:FORI=1984TO2023:POKEI,72
610 POKEI+CO,4:NEXT:TL=1983:WL=1984:L=56320:QQ=215:IFLI<1THEN23100
999 RETURN
1000 SYSA0:IFFNA(A)=1ORFNB(B)=1THENPOKES1,0:GOTO22000
1010 POKETL,32:POKEWL,72:POKEWL+CO,6:TL=TL-.1:WL=WL+.3:IFPEEK(L)=111THENGOSUB230
00
1012 IFTL<1945ORWL>2022THEN22000
1099 RETURN
10000 POKE53280,2:POKE53281,3:GOSUB13250:R=0:LE=1
10005 PRINT"[illegible]":PRINTD$;D$;A$;C$;"[illegible]";B$;A$;D$;D$:PRINT"[illegible]";:PRINTF$
10006 PRINT"[illegible]":PRINTG$:PRINT"[illegible]":PRINTTAB(31);G$:GOSUB12550:POKEV+21,255
10008 GOSUB600:POKEV+1,170:POKEV,235:POKEV+30,0:POKEV+31,0:R=0:POKE2041,214
10009 GOSUB24000
10010 GOSUB1000:R=R+1:IFR>39THENR=0
10050 IFPEEK(V+1)<45THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO30000
10110 PRINT"[illegible]";TAB(R);E$;"[illegible]";TAB(R);E$;"[illegible]";TAB(R);E$
10199 GOTO10010
11000 PRINT"[illegible]":POKE53280,2:POKE53281,3:GOSUB13250
11005 PRINT"[illegible]"
11006 PRINT"[illegible]"
11007 PRINT"[illegible]"
11008 PRINT"[illegible]"
11009 PRINT"[illegible]"
11010 PRINT"[illegible]"
11011 PRINT"[illegible]"
11012 PRINT"[illegible]"
11013 PRINT"[illegible]"
11014 PRINT"[illegible]"
11015 PRINT"[illegible]"
11016 PRINT"[illegible]"
11017 PRINT"[illegible]"
11018 PRINT"[illegible]"
11019 PRINT"[illegible]"
11020 PRINT"[illegible]"
11021 PRINT"[illegible]"
11022 PRINT"[illegible]"
11023 PRINT"[illegible]"
11024 PRINT"[illegible]"
11025 PRINT"[illegible]"
11026 PRINT"[illegible]"
11027 PRINT"[illegible]"
11038 GOSUB600:SYS36864:POKEV,40:POKEV+1,210:POKEV+3,126:POKEV+30,0:POKEV+31,0
11039 POKE2041,222:LE=2:GOSUB24000:GOSUB12550:POKEV+28,3:POKEV+21,255
11040 GOSUB1000
11060 IFPEEK(V+1)<43THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO30000
11099 GOTO11040
11100 POKE53280,2:POKE53281,3:GOSUB13250:LE=3:V=53248:POKEV+28,1:POKEV+21,255
11105 PRINT"[illegible]":PRINTD$;D$;A$;C$;"[illegible]";B$;H$;D$;D$:POKE2041,223
11106 PRINT"[illegible]";:PRINTF$:PRINT"[illegible]";:POKEV+40,5
11107 PRINTTAB(24);F$:PRINT"[illegible]":PRINTG$:PRINT"[illegible]":PRINTTAB(31);G$:GOSUB12550
11108 PRINT"[illegible]";:PRINTTAB(4)H$;"[illegible]";H$;"[illegible]";H$;"[illegible]";H$
11128 GOSUB600:POKEV+1,170:POKEV,235:POKEV+30,0:POKEV+31,0:POKEV+3,155
11139 LE=3:GOSUB24000:GOSUB12550
11140 GOSUB1000
11160 IFPEEK(V+1)<43THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO10000
11199 GOTO11140
11200 POKE53280,4:POKE53281,3:PRINT"[illegible]":PRINTC$;
11210 FORT=0TO20:PRINT"[illegible]";:NEXT:PRINTB$
11220 PRINT"[illegible]":PRINTTAB(4);H$;TAB(13);H$;TAB(22);H$;TAB(31);H$
11225 PRINT"[illegible]":PRINTTAB(31);G$
11230 PRINT"[illegible]":PRINTTAB(4);H$;"[illegible]";TAB(13);H$;TAB(22);H$;TAB(31);H$
11235 PRINT"[illegible]":PRINTTAB(13);H$
11240 PRINT"[illegible]":PRINTTAB(11);"[illegible]"TAB(20);"[illegible]"TAB(29);"[illegible]"
11245 PRINT"[illegible]":PRINTTAB(20);"[illegible]"
11250 PRINT"[illegible]":PRINTTAB(7)"[illegible]"
11255 POKEV+21,255:PRINT"[illegible]"
11268 GOSUB600:SYS36864:POKEV,241:POKEV+1,195:POKEV+3,200:POKEV+30,0:POKEV+31,0
11269 POKE2041,222:LE=4:GOSUB24000:GOSUB12550:POKEV+28,3:POKE2040,205
11280 GOSUB1000
11290 IFPEEK(V+1)<43THENSC=SC+(LE*500)+INT(TL)-INT(WL/5):GOTO10000
11299 GOTO11280
12550 PRINT"[illegible]";:PRINTTAB(34)SC;:PRINTTAB(74);LI
12555 PRINT"[illegible]";:PRINTTAB(34);LE:RETURN
13250 POKE2040,205:FORI=5TO15STEP2:POKEV+I,0:NEXT:POKEV+30,0:POKEV+31,0:RETURN
22000 SYS36864+256
22005 D=217: POKES1,16:POKES2,15:FORJ=5TO25:A=A+1:IFA>8THEND=D+1:POKE2040,D:A=0
22010 FORJJ=5TOJSTEP.5:POKES3,JJ:POKES1,33:NEXTJJ,J:POKEV+27,1:POKES1,0
22015 POKES1,128:POKES2,119
22020 X=PEEK(V):Y=PEEK(V+1):POKEV,X:FORT=YTO250STEP5:FORTT=220TO221:POKE2040,TT
22030 POKES1,128:POKEV+1,T:POKES3,250:POKES1,129:FORA=0TO20
22035 NEXTA,TT,T:POKEV+27,0:LI=LI-1: SYS36864:IFLI<1THENGOSUB23100:GOTO60000
22040 ONLEGOTO10000,11000,11100,11200,30000
23000 IFWL<1985THENRETURN
23005 POKEWL,72:POKEWL+CO,4:QQ=QQ+1:IFQQ>216THENQQ=215
23010 WL=WL-1:POKE2040,QQ:RETURN
23100 K$="[illegible]                GAME  OVER":POKEV+21,0:POKE53280,11
23140 POKE53281,11:POKES1,16:POKES1+7,32:POKES1+14,32:POKES2,31:POKES2+7,15
23145 POKES2+14,31:SYS36864+256
23150 FORTT=100TO5STEP-4:POKES3,TT:POKES3+7,TT+10:POKES3+14,TT+20:POKES1,17
23151 POKES1+7,33:POKES1+14,33:PRINTK$:POKE646,INT(RND(1)*15):NEXT
23155 PRINTK$:PRINT"              SCORE ";SC:FORT=0TO2500:NEXT:RETURN
24000 PRINT"[illegible]";:PRINTTAB(32)"SC";
24005 PRINT"[illegible]";:PRINTTAB(32)"LI";
24010 PRINT"[illegible]";:PRINTTAB(32)"LA"
24020 RETURN
30000 POKE53272,31:CH=14336:U=15496:POKE53280,0:O=1024:W=1200:POKE198,0:FF=255
30005 POKE56331,1
30010 V=53248:FORI=0TO7:POKECH+I+W,FF:NEXT:POKE53281,3
30014 PRINT"[illegible]":POKE53281,0:SYS49900:FORI=1024TO1200:POKEI+CH,0:NEXT
30020 POKE2040,244:X=20:Y=171:POKEV+21,1:POKEV,X:POKEV+1,Y:POKEV+31,0
30050 PRINTTAB(37)"[illegible]":PRINTTAB(37)"[illegible]":PRINTTAB(37)"[illegible]"
30055 PRINTTAB(37)"[illegible]"TAB(34)"[illegible]":PRINTTAB(34)"[illegible]"
30060 PRINTTAB(34)"[illegible]":PRINTTAB(30)"[illegible]"
30065 PRINTTAB(30)"[illegible]":PRINTTAB(22)"[illegible]"
30070 PRINTTAB(22)"[illegible]"
30075 PRINTTAB(10)"[illegible]"
30080 PRINTTAB(10)"[illegible]"
30085 PRINTTAB(10)"[illegible]"
30090 PRINT"[illegible]"
30095 PRINT"[illegible]"
30100 PRINT"[illegible]"
30105 PRINT"[illegible]"
30110 PRINT"[illegible]"
30115 PRINT"[illegible]"
30120 PRINT"[illegible]"
30122 PRINT"[illegible]"
30124 PRINT"[illegible]"
30126 PRINT"[illegible]"
30127 PRINT"[illegible]"
30129 PRINT"[illegible]"
30130 PRINT"[illegible]"
30132 PRINT"[illegible]"
30134 PRINT"[illegible]"
30136 PRINT"[illegible]"
30138 PRINT"[illegible]":IFDD=1THENDD=0:RETURN
30139 POKEV+31,0:Z=0:R=56320
30140 POKEV,X+256*(X>255):POKEV+16,(PEEK(V+16)AND253)OR-(X>255):POKEV+1,Y
30150 POKEU,FF:U=U-.3:V=V-.3:POKEV+1,Y:POKEV+31,0:POKEV+30,0:PP=PEEK(R):X=X+2
30155 SC=SC+1:IFPP=123THENX=X-1:V=V-.4:U=U-.4
30157 IFPP=119THENX=X+2:V=V-.2:U=U-.2
30165 IFPP=126THENV=V-.7:U=U-.7
30170 IFFNB(B)=1THENPOKEV+16,0:LI=LI-1:ONLEGOTO10000,11000,11100,11200,10000
30175 IFX>330THENPOKEV+16,0:LI=LI+1:ONLEGOTO11000,11100,11200,10000
30199 GOTO30140
60000 POKE53280,11:POKE53281,0:POKE53272,31:SYS37120:POKE53248+21,0:RESTORE
60001 FORI=54272TO54296:POKEI,0:NEXT:POKE54296,15
60005 POKE53265,PEEK(53265)OR16
60010 V=53248:POKEV+21,31:POKEV+23,255:POKEV+29,255:FORI=39TO46:POKEV+I,13:NEXT
60015 POKEV+28,0:QQ=250:POKEV+27,0:DD=1:PRINT"[illegible]":GOSUB30050
60027 PRINT"[illegible] BY FRANK TOUT !!!HIT SPACE BAR TO PLAY "
60030 X1=75:X2=125:X3=165:X4=205:X5=245:Y1=255
60032 POKEV,X1:POKEV+2,X2:POKEV+4,X3:POKEV+6,X4:POKEV+8,X5
60035 FORI=1TO9STEP2:POKEV+I,Y1:NEXT:FORI=2040TO2044:QQ=QQ+1:POKEI,QQ:NEXT
60040 FORY1=255TO55STEP-1:POKEV+1,Y1:POKEV+3,Y1:POKEV+5,Y1:POKEV+7,Y1:POKEV+9,Y1
60042 NEXTY1:C=000: A=000:B=000
60045 FORI=39TO46:POKEV+I,13:NEXT
60084 GETX$
60085 POKES1+7,16:POKES1,32:POKES1+14,16:POKES2+14,31
60090 POKES2+7,31:POKES2,15:READA,B,C:POKES3+7,A:POKES3+14,B:POKES3,C
60994 POKES1+7,17:POKES1,33:POKES1+14,17:IFC=000THENRESTORE:GOTO60090
60995 FORT=0TO150:NEXT:IFX$=""THEN60084
60996 IFX$=" "THEN60998
60997 GOTO60084
60998 SYS36864:GOSUB63000:CLR:V=53248:POKEV+23,0:POKEV+29,0:RESTORE
60999 FORI=2042TO2047:POKEI,215:NEXT:GOTO1
61005 DATA5,5,5,10,10,10,5,5,5,10,10,10,5,5,5,10,10,10,5,5,5,10,10,10
61010 DATA5,10,20,20,10,5,5,5,5,10,20,5,5,10,5,5,5,5,5,5,10,10,10,20,20,20
61015 DATA10,10,30,10,20,30,10,50,50,10,60,70,10,40,60,10,30,70,10,20,60,10,10,5
61020 DATA20,30,20,30,40,30,40,50,40,60,60,60,50,40,30,40,30,20,30,20,10,20,10,5
61025 DATA20,30,40,20,30,40,20,30,40,40,50,60,40,50,60,40,50,60,30,20,10,20,10,5
61030 DATA20,30,20,30,40,30,40,50,40,60,60,60,50,40,30,40,30,20,30,20,10,20,10,5
61035 DATA10,5
61199 DATA000,000,000
63000 POKE53280,3:POKE53281,3:PRINT"[illegible]":POKE53272,31
63010 A1$="[illegible]"
63015 A2$="[illegible]"
63020 A3$="[illegible]"
63025 A4$="[illegible]":A5$="[illegible]":A6$="[illegible]"
63050 PRINT"[illegible]":PRINTTAB(33)"[illegible]":PRINTTAB(32)"[illegible]"
63055 PRINTTAB(31)"[illegible]":PRINTTAB(30)"[illegible]"
63060 PRINTTAB(29)"[illegible]"
63065 PRINTTAB(29);A4$TAB(29);A5$TAB(69);A5$TAB(69)A4$
63070 PRINTTAB(29);A4$TAB(29);A5$TAB(69);A5$TAB(69)A4$
63075 PRINTTAB(7);A3$TAB(8);A2$TAB(40);A2$TAB(47);A3$TAB(48);A2$TAB(88);A2$
63080 FORT=0TO4:PRINTA1$:NEXT:PRINT"[illegible]":PRINTTAB(67);A6$
63082 PRINTTAB(7)"[illegible]"
63084 POKE2040,245:V=53248:POKEV+21,3:POKEV,36:POKEV+1,166:POKEV+28,3
63086 POKEV+37,7:POKEV+38,0:POKEV+39,1:POKEV+23,3:POKEV+29,3:POKEV+27,2
63088 POKE2041,237:POKEV+2,240:POKEV+3,121:POKEV+40,10:X=240
63090 FORT=0TO30:FORZ=246TO250:POKE2041,Z:X=X-1:POKEV+2,X:FORA=0TO20:NEXTA,Z,T
63095 FORY=121TO166:POKEV+3,Y:NEXT
63097 FORX1=36TO20STEP-.2:POKEV,X1:POKEV+2,X1:NEXT:POKEV+23,0:POKEV+29,0:RETURN
```

Listing 1.

```
10 *LOAD "TANKS-DATA" 4000
20 CHAIN "TANKS-3"
```

Listing 2.

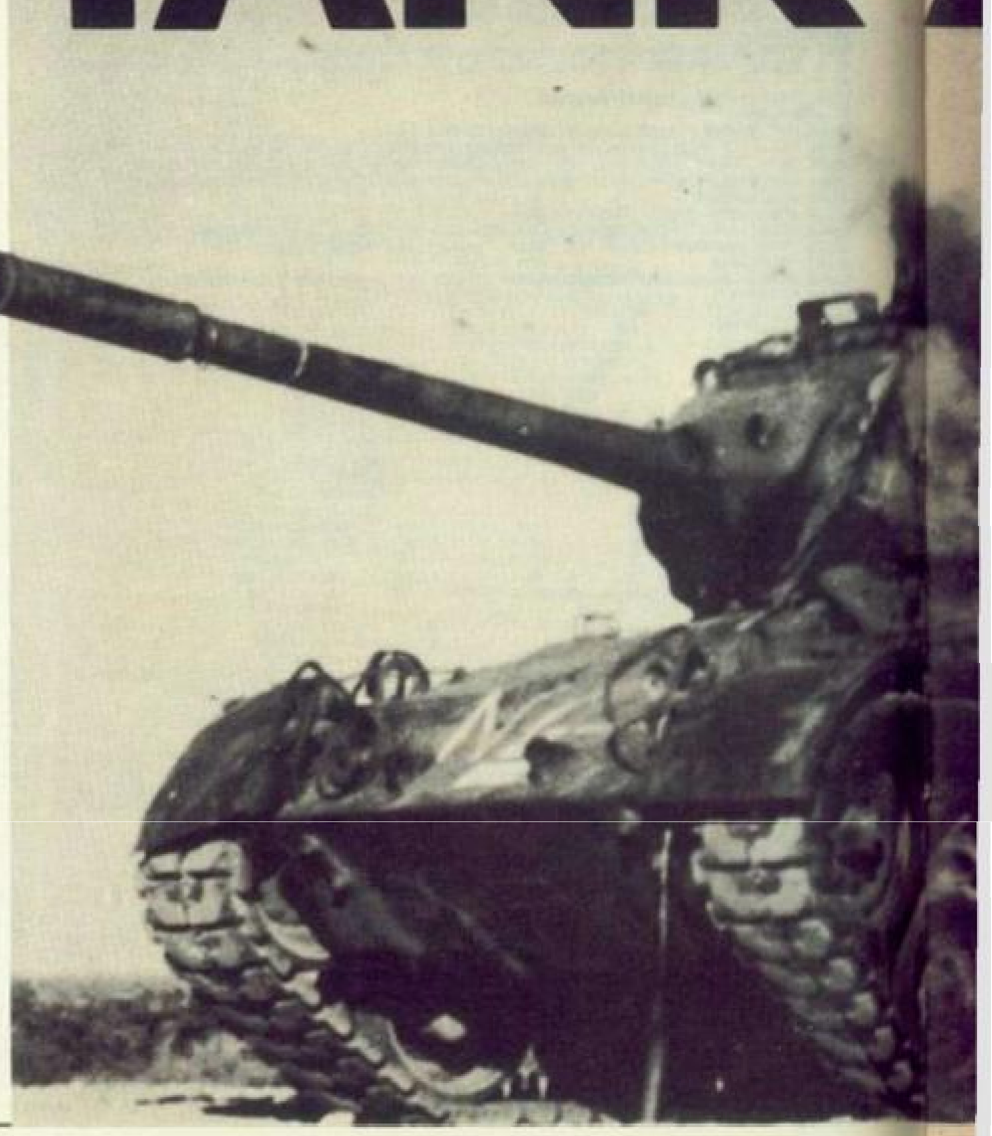
```
   10 REM TANKS-2 BY N.SHEARD
   20 MODE 4
   30 VDU 29,652;524;
   40 MOVE 0,0:LOC%=&4000
   50 FOR Z%=0 TO 2
   60 CLS
   70 PROCdatachasvert
   80 X%=340
   90 RESTORE X%
  100 PROCdrawvert
  110 NEXT Z%
  120 PROCdatachasdiag
  130 X%=390
  140 PROCdrawdiag
  150 CLS
  160 PROCdataturretvert
  170 X%=440
  180 PROCdrawvert
  190 PROCdataturretdiag
  200 X%=480
  210 PROCdrawdiag
  220 CLS
  230 PROCdataenturvert
  240 X%=520
  250 PROCdrawvert
  260 PROCdataenturdiag
  270 X%=560
  280 PROCdrawdiag
  290 FOR CIRC%=0 TO 360 STEP 30:X%=CIRC%*PI/90:A%=44*
COS X%:B%=44*SIN X%:MOVE 0,0:DRAW A%,B%:NEXT
  300 PROCstore
  310 *SAVE "TANKS-DATA" 4000 4948
  320 END
  330 DEFPROCdatachasvert
  340 DATA -1004,8,-4,-7,-5,-8,-6,-8,-7,-7,-7,8,-6,9,-
5,9,-3,7,5,7,5,8,5,-7,6,-8,7,-8,8,-7,8,8,7,9,6,9,5,8,5
,5,-4,5,-4,-4,5,-4,5,-5,-4,-5,-4,-6,5,-6,5,Z%-7,8,Z%-7
,8,Z%-4,5,Z%-4,5,Z%-1,8,Z%-1,8,Z%+2,5,Z%+2,5,Z%+5,8,Z%
+5
  350 DATA -1007,Z%-7,-4,Z%-7,-4,Z%-4,-7,Z%-4,-7,Z%-1,
-4,Z%-1,-4,Z%+2,-7,Z%+2,-7,Z%+5,-4,Z%+5,1500,1500
  360 ENDPROC
  370
  380 DEFPROCdatachasdiag
  390 DATA 1003,9,3,10,2,10,2,11,1,11,-10,0,-10,-1,-9,
-2,-8,-2,3,9,2,8,8,2,10,2,11,1,11,0,1,-10,0,-10,-1,-9,
-1,-8,9,2,7,0,1,6,0,6,-6,0,-6,-1,0,-7,-1,-7,-7,-1,-1,-
7,-2,-7,-7,-2,-7,-1,-9,1,-7,3,-5,1,-3,3,-5,5,-3,7,-1,5
,1,7,-1,9,1000,1,10,-1
  400 DATA 8,-3,6,-1,4,-3,6,-5,4,-7,2,-5,0,-7,2,-9,150
0,1500
  410 ENDPROC
  420
  430 DEFPROCdataturretvert
  440 DATA -1001,-4,2,-4,2,-3,-1,-3,-2,-2,3,-2,3,-1,-2
,-1,-3,0,4,0,4,1,-3,1,-3,2,4,2,3,3,-2,3,-1,4,2,4,1,4,1
,11,0,11,0,4,1500,1500
  450 ENDPROC
  460

  470 DEFPROCdataturretdiag
  480 DATA -1002,-4,-4,-2,-4,-1,-1,-4,-1,-3,-3,-1,-3,0
,0,-3,1,-3,-3,1,-3,2,2,-3,2,-2,-2,2,-2,3,3,-2,3,-1,-1,
3,0,3,3,0,3,1,1,3,2,3,3,2,9,8,8,9,3,3,3,4,7,8,1500,150
0
  490 ENDPROC
  500
  510 DEFPROCdataenturvert
  520 DATA -1001,-4,2,-4,2,-3,-1,-3,-1,-1,-2,-1,-2,-2,
-2,-1,-3,0,-3,2,-1,2,-2,3,-1,3,-1,4,0,4,0,11,1,11,1,4,
2,4,2,2,3,3,3,2,4,2,4,0,2,-2,2,-1,3,-2,1500,1500
  530 ENDPROC
  540
  550 DEFPROCdataenturdiag
  560 DATA -1002,-4,-4,-2,-4,-1,-1,-4,-1,-3,0,-2,0,-3,
2,-3,2,-2,3,-2,3,0,2,0,3,1,3,2,9,8,8,9,3,3,3,4,7,8,2,3
,0.3,0,2,-1,3,-2,3,-2,2,-3,2,-3,0,-2,0,-3,-1,1500,1500
  570 ENDPROC
  580
  590 DEFPROCdrawvert
  600 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 620
  610 PROCdraw
  620 UNTIL A%=1500:PROCstore:RESTORE X%:CLS:MOVE 0,0
  630 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 670
  640 IF A%>1000 THEN A%=A%-1000:C%=A%:A%=B%:B%=C%:A%=
A%+1000:PROCdraw:UNTIL FALSE
  650 IF A%<-1000 THEN A%=A%+1000:C%=A%:A%=B%:B%=C%:A%
=A%-1000:PROCdraw:UNTIL FALSE
  660 C%=A%:A%=B%:B%=C%:PROCdraw
  670 UNTIL A%=1500:PROCstore:RESTORE X%:CLS:MOVE 0,0
  680 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 700
  690 A%=A%*-1:B%=B%*-1:PROCdraw
  700 UNTIL A%=1500:PROCstore:RESTORE X%:CLS:MOVE 0,0
  710 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 750
  720 IF A%>1000 THEN A%=A%-1000:C%=A%:A%=B%:B%=C%:A%=
```



BBC

TANK



TANKS IS an arcade-style game for the BBC Micro with operating system OS 1.2. The program features machine-code, flicker-free, high-resolution graphics, with independent rotation of the tanks' turrets and chassis, music, animated lives and a high-resolution title page.

To get the program Saved on tape, first type in listing 1 and Save it as Tanks-1, then type in listing 2 and Save it as Tanks-2 on a different tape. Run Tanks-2 and a series of rotations of tank's chassis, turrets and trees will appear on the screen followed by the message "Record then return".

Start your tape recording straight after Tanks-1 and press Return. Finally, type in listing 3 and Save it as Tanks-3 after Tanks Data. To load the game

CHAIN "TANKS-1"

which will draw the title page and automatically load the other sections.

When the whole program has loaded, the instructions will be displayed. The object of the game is to destroy all enemy tanks — those with crosses on their turrets — by cleverly chasing and ambushing them. You score 100 points for each tank destroyed and 1,000 points for each screen completed.

After losing a life or on starting a new game your tank automatically drives from the barracks, at the top right of the screen, to the centre of the screen ready for action, during which the music plays. At the end of the game the last score and the highest score are displayed.

In writing the game the first problem was that, to obtain the necessary independence of rotation of a tank's chassis and turret, a total of 128 3-by-3 character matrices had to be defined, or 1,152 characters, or 9,216 numbers would have had to be typed in. This is obviously a massive waste of memory and would be very prone to error.

The alternative was to separate the turret and chassis into different characters and overlay one of the eight different rotations of each on to the other. This can be done using the Basic function Or, which affects the bits of two numbers when written in binary such that:

01010100 OR 00110101 = 01110101

It can be seen from this that if there is a 1 in any or both of the corresponding positions of the numbers then a 1 will appear in the corresponding position in the answer. Only where there is an 0 in both of the corresponding positions of the numbers does an 0 appear in a corresponding position in the answer. Thus:

8 OR 53 = 117

Unfortunately, using Or is too slow to produce flicker-free graphics and so I wrote a machine-code subroutine which appears at line 1940 in listing 3. ORA is the equivalent function to Or in assembly language and takes the form:

```
LDA (first number):
ORA (second number):
STA (on screen)
```

As you can see I have directly accessed the screen for ease and speed and so second processors must be disconnected before running the program.

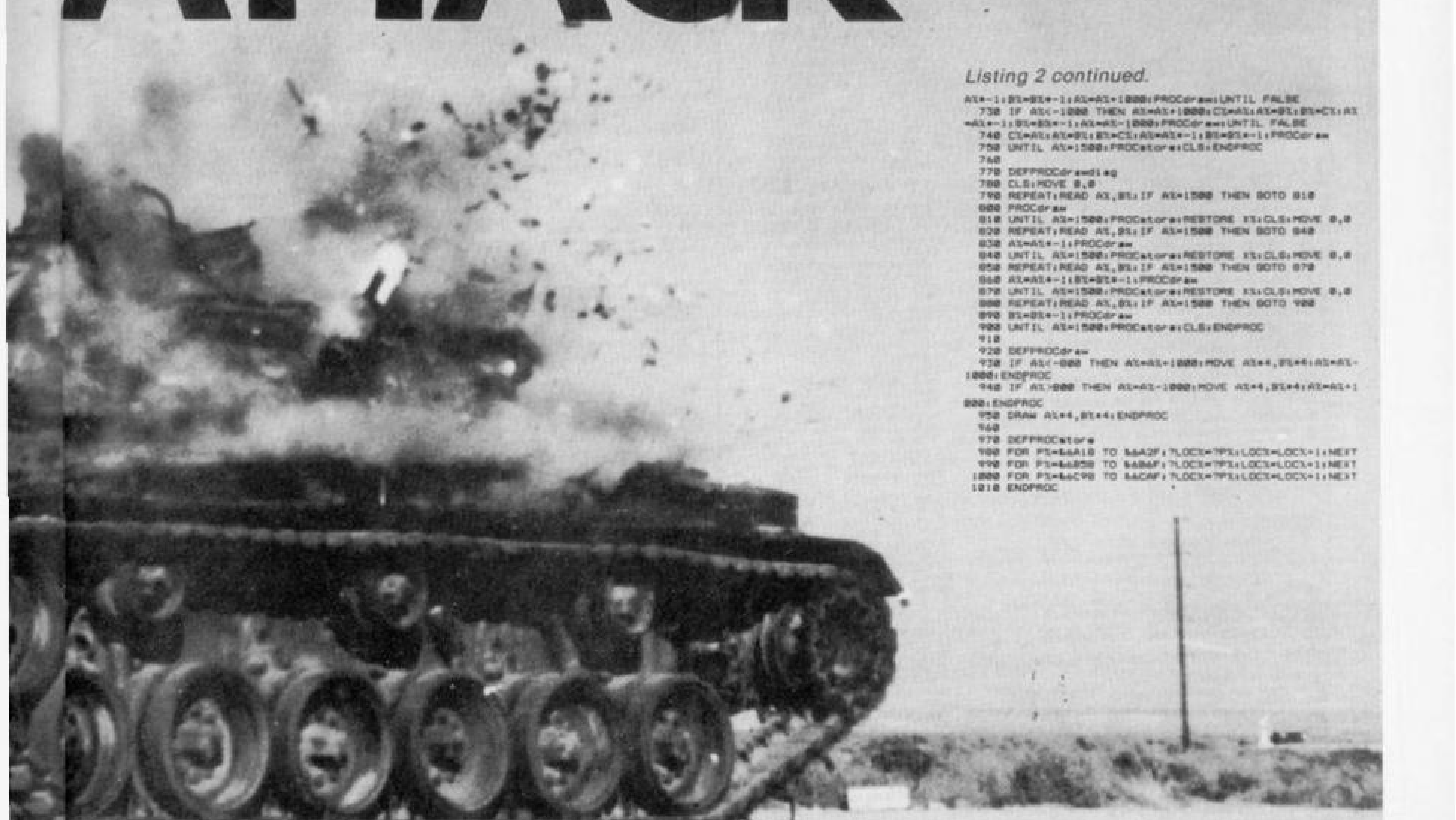
With the program altered to accept this only 24 3-by-3 character matrices are required, that is 1,728 numbers to be typed in, which is still too prone to error. The solution was simple, use the BBC's processing power to rotate the shapes — from just two of the most important rotations of each shape entered from the keyboard — to create the remaining rotations and store them in the memory before the game begins. Listing 2 does this by reflecting the shapes in varying lines.

With this entered and working correctly only six of the 128 3-by-3 character matrices that will appear on the screen have to be defined.

If you wish to have a copy of the game, but do not have the time to type it in, it is available from N Sheard, 2 Ashbrook Drive, Prestbury, Cheshire SK10 4BY, on cassette for £4 including P&P.

(continued on next page)

ATTACK



Listing 2 continued.

```
A%=A%*-1:B%=B%*-1:A%=A%+1000:PROCdraw:UNTIL FALSE
  730 IF A%<-1000 THEN A%=A%+1000:C%=A%:A%=B%:B%=C%:A%
=A%*-1:B%=B%*-1:A%=A%-1000:PROCdraw:UNTIL FALSE
  740 C%=A%:A%=B%:B%=C%:A%=A%*-1:B%=B%*-1:PROCdraw
  750 UNTIL A%=1500:PROCstore:CLS:ENDPROC
  760
  770 DEFPROCdrawdiag
  780 CLS:MOVE 0,0
  790 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 810
  800 PROCdraw
  810 UNTIL A%=1500:PROCstore:RESTORE X%:CLS:MOVE 0,0
  820 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 840
  830 A%=A%*-1:PROCdraw
  840 UNTIL A%=1500:PROCstore:RESTORE X%:CLS:MOVE 0,0
  850 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 870
  860 A%=A%*-1:B%=B%*-1:PROCdraw
  870 UNTIL A%=1500:PROCstore:RESTORE X%:CLS:MOVE 0,0
  880 REPEAT:READ A%,B%:IF A%=1500 THEN GOTO 900
  890 B%=B%*-1:PROCdraw
  900 UNTIL A%=1500:PROCstore:CLS:ENDPROC
  910
  920 DEFPROCdraw
  930 IF A%<-800 THEN A%=A%+1000:MOVE A%*4,B%*4:A%=A%-
1000:ENDPROC
  940 IF A%>800 THEN A%=A%-1000:MOVE A%*4,B%*4:A%=A%+1
000:ENDPROC
  950 DRAW A%*4,B%*4:ENDPROC
  960
  970 DEFPROCstore
  980 FOR P%=&AA10 TO &AA2F:?LOC%=?P%:LOC%=LOC%+1:NEXT
  990 FOR P%=&AB50 TO &AB6F:?LOC%=?P%:LOC%=LOC%+1:NEXT
 1000 FOR P%=&AC90 TO &ACAF:?LOC%=?P%:LOC%=LOC%+1:NEXT
 1010 ENDPROC
```

(continued from previous page)

Listing 3.

```
   10 REM TANKS-3 BY N.SHEARD
   20 ON ERROR GOTO 50
   30 HI%=0
   40 SCORE%=0
   50 MODE 7:VDU 23;8202;0;0;0;
   60 PROCinstructions
   70 MODE 4:VDU 23;8202;0;0;0;
   80 VDU 19,1,0,0,0,0:VDU 19,0,3,0,0,0
   90 LIVES%=4

  100 PROCmachinecode
  110 RESTORE:PROCdata
  120 PROCnewlife
  130 GOTO 160
  140 RESTORE:PROCdata
  150 PROCscreen
  160 G%=20:H%=16
  170 TUR%=0:CHAS%=0:ROT%=1
  180 DIR%=0:TRACK%=2:GUN%=4
  190 PROCgame
  200 IF ?&5030=0 AND ?&5038=0 AND ?&5040=0 AND ?&5048=0 SCORE%=SCORE%+1000:RESTORE:PROCdata:CLS:GOTO140
  210 GOTO 190

  220
  230 DEFPROCdraw
  240 A%=(A%*72)+&4000:B%=(B%*72)+&4000
  250 E%=(D%*320)+(C%*8)+&5800:?&72=E% MOD 256
  260 ?&74=A% MOD 256:?&75=A% DIV 256
  270 ?&76=B% MOD 256:?&77=B% DIV 256
  280 ?&72=E% MOD 256:?&73=E% DIV 256
  290 CALL control
  300 ENDPROC

  310
  320 DEFPROCcheck
  330 E%=(D%*320)+(C%*8)+&5800
  340 ?&72=E% MOD 256:?&73=E% DIV 256
  350 CALL check
  360 ENDPROC

  370
  380 DEFPROCclear
  390 E%=(D%*320)+(C%*8)+&5800
  400 ?&72=E% MOD 256:?&73=E% DIV 256
  410 CALL blank
  420 ENDPROC

  430
  440 DEFPROCdata
  450 DATA 0,12,1,15,2,14,3,13
  460 FOR I%=&5000 TO &5007:READ X%:?I%=X%:NEXT
  470 DATA 16,20,17,23,18,22,19,21
  480 FOR I%=&5010 TO &5017:READ X%:?I%=X%:NEXT
  490 DATA 24,28,25,31,26,30,27,29
  500 FOR I%=&5020 TO &5027:READ X%:?I%=X%:NEXT
  510 DATA 0,134,162,99,166,144,12,86,200,0,102,238,96,0
  520 MEM%=&4200
  530 FOR X%=1 TO 14:READ F%:A%=128
  540 REPEAT:IF (A% AND F%) THEN ?MEM%=1 ELSE ?MEM%=0
  550 A%=A% DIV 2:MEM%=MEM%+1:UNTIL A%=0:NEXT X%
  560 VDU 23,224,85,170,85,170,85,170,85,170
  570 VDU 23,225,0,0,255,0,0,255,0,0

  580 VDU 23,226,0,0,0,24,24,0,0,0
  590 DATA 1,1,0,0,10,2,2,25,1,1,4,4,10,2,2,5,1,1,0,0,10,2,35,6,1,1,0,0,10,2,35,27
  600 FOR I%=&5030 TO &504F:READ X%:?I%=X%:NEXT
  610 REPEAT:?(&5030+(INT(RND(4))-1)*8)=0:UNTIL RND(1)>.2
  620 FOR I%=&5060 TO &507F:?I%=0:NEXT
  630 DATA 13,6,13,6,13,6,21,12,29,6,33,6,49,12,49,6,41,6,33,6,21,12,33,6,13,12,13,6,13,6,13,6,21,12,29,6,33,6,49,12,49,6,41,6,33,6,21,12,33,6,13,24,1,1
  640 LOC%=&5700:REPEAT:READ A%,B%:?LOC%=A%:?(LOC%+1)=B%:LOC%=LOC%+2:UNTIL A%=1
  650 ENDPROC

  660
  670 DEFPROCtank
  680 TRACK%=TRACK%+4:IF TRACK%=14 TRACK%=2
  690 IF ROT%=1 GUN%=GUN%-1 ELSE GUN%=GUN%+1
  700 IF GUN%>5 ROT%=1
  710 IF GUN%<3 ROT%=0
  720 IF LIVES%=1 GOTO 740
  730 A%=(?(&5010+GUN%)*72)+&4000:?&74=A% MOD 256:?&75=A% DIV 256:B%=(TRACK%*72)+&4000:?&76=B% MOD 256:?&77=B% DIV 256:?&80=LIVES%:CALL lives
  740 C%=G%:D%=H%
  750 CHAS%=CHAS%-(INKEY(-67))+(INKEY(-98))
  760 TUR%=TUR%-(INKEY(-67))+(INKEY(-98))
  770 TUR%=TUR%-(INKEY(-105))+(INKEY(-104))
  780 IF TUR%<0 TUR%=7
  790 IF TUR%>7 TUR%=0
  800 IF CHAS%<0 CHAS%=7
  810 IF CHAS%>7 CHAS%=0
  820 A%=?(CHAS%+&5000):B%=?(TUR%+&5010)
  830 FILX%=C%:FILY%=D%
  840 IF INKEY(-99) AND CHAS%=0 THEN D%=D%-1
  850 IF INKEY(-99) AND CHAS%=2 THEN C%=C%+1
  860 IF INKEY(-99) AND CHAS%=4 THEN D%=D%+1
  870 IF INKEY(-99) AND CHAS%=6 THEN C%=C%-1
  880 VARX%=C%:VARY%=D%
  890 C%=FILX%:D%=FILY%
  900 PROCclear
  910 C%=VARX%:D%=VARY%
  920 PROCcheck
  930 IF ?&78>0 C%=G%:D%=H% ELSE G%=C%:H%=D%
  940 PROCdraw
  950 IF INKEY(-1) AND TUR% MOD 2=0 THEN GOTO 960:ELSE ENDPROC
  960 F%=&5070:IF ?F%=0 GOTO 980
  970 F%=&5074:IF ?F%=0 GOTO 980 ELSE ENDPROC
  980 ?F%=1:?(F%+1)=TUR%:?(F%+2)=G%+1:?(F%+3)=H%+1:I%=F%:PROCmoveshell:C%=?(F%+2):D%=(F%+3):PROCshellcheck:SOUND 0,-15,4,2
  990 IF ?&78=0 ?F%=0
 1000 ENDPROC

 1010
 1020 DEFPROCscreen
 1030 MEM%=&4200
 1040 FOR Y%=4 TO 28 STEP 3:FOR X%=2 TO 35 STEP 3:IF ?MEM%=1 A%=32:B%=33:C%=X%:D%=Y%:PROCdraw
 1050 MEM%=MEM%+1:NEXT X%:NEXT Y%
 1060 FOR Y%=0 TO 28:PRINTTAB(Y%,0);CHR$(224):NEXT

 1070 FOR A%=0 TO 29:PRINTTAB(0,A%);CHR$(224);CHR$(224):PRINTTAB(38,A%);CHR$(224);CHR$(224):NEXT
 1080 FOR A%=0 TO 38:PRINTTAB(A%,3)CHR$(224):NEXT
 1090 FOR A%=&7E80 TO &7FFF STEP 2:?A%=85:?(A%+1)=170:NEXT
 1100 FOR A%=0 TO 2:PRINTTAB(26,A%);CHR$(224);CHR$(224);CHR$(224):NEXT
 1110 PRINTTAB(29,3);CHR$(225);CHR$(225);CHR$(225):PRINTTAB(0,30);CHR$(224);CHR$(224)
 1120 PRINTTAB(5,2);"SCORE=";SCORE%:PRINTTAB(5,1);"HI-SCORE=";HI%
 1130 IF LIVES%=4 GOTO1150
 1140 C%=29:FOR VAR%=0 TO LIVES%-1:A%=2:B%=18:C%=29+VAR%*3:D%=0:PROCclear:NEXT
 1150 IF LIVES%=1 ENDPROC
 1160 C%=29:FOR VAR%=0 TO LIVES%-2:A%=2:B%=18:C%=29+VAR%*3:D%=0:PROCdraw:NEXT
 1170 ENDPROC
 1180
 1190 DEFPROCenemytanks
 1200 FOR I%=&5030 TO &504F STEP 8
 1210 ENX%=?(I%+6):ENY%=?(I%+7)

 1220 IF ?I%=0 NEXT I%:ENDPROC
 1230 PROCsearch
 1240 C%=ENX%:D%=ENY%
 1250 PROCclear
 1260 IF ?(I%+4)<>10 GOTO 1310
 1270 IF ?(I%+2)=0 THEN D%=D%-1
 1280 IF ?(I%+2)=2 THEN C%=C%+1
 1290 IF ?(I%+2)=4 THEN D%=D%+1
 1300 IF ?(I%+2)=6 THEN C%=C%-1
 1310 PROCcheck:IF ?&78=0 ?(I%+6)=C%:?(I%+7)=D% ELSE C%=ENX%:D%=ENY%:?(I%+6)=C%:?(I%+7)=D%
 1320 A%=?(&5000+?(I%+2)):B%=?(&5020+?(I%+3))
 1330 PROCdraw
 1340 ?&78=0
 1350 A%=((INT(RND(3))-1)*4)+&5060
 1360 IF ?(I%+3) MOD 2=0 AND ?A%=0 AND RND(1)>.2 ?A%=1:?(A%+1)=?(I%+3):?(A%+2)=?(I%+6)+1:?(A%+3)=?(I%+7)+1:F%=I%:I%=A%:PROCmoveshell:PROCmoveshell:I%=F%:C%=?(A%+2):D%=?(A%+3):PROCshellcheck:SOUND 0,-15,6,2
 1370 IF ?&78=1 ?A%=0
 1380 NEXT I%:ENDPROC

 1390
 1400 DEFPROCsearch
 1410 ?(I%+3)=?(I%+2)+GUN%-4
 1420 IF ?(I%+4)=10 AND (ENX%-2) MOD 3=0 AND (ENY%-1) MOD 3=0 THEN PROCdirection
 1430 IF ?(I%+4)>10 ?(I%+2)=?(I%+2)+1:?(I%+3)=?(I%+3)+1:?(I%+4)=?(I%+4)-1
 1440 IF ?(I%+4)<10 ?(I%+2)=?(I%+2)-1:?(I%+3)=?(I%+3)-1:?(I%+4)=?(I%+4)-1
 1450 IF ?(I%+4)=0 OR ?(I%+4)=100 ?(I%+4)=10
 1460 IF ?(I%+3)>250 ?(I%+3)=7
 1470 IF ?(I%+3)>7 ?(I%+3)=?(I%+3)-8
 1480 IF ?(I%+2)>250 ?(I%+2)=7
 1490 IF ?(I%+2)>7 ?(I%+2)=0
 1500 ENDPROC
 1510
 1520 DEFPROCdirection

 1530 C%=ENX%:D%=ENY%:E%=(D%*320)+(C%*8)+&5800:?&7C=E% MOD 256:?&7D=E% DIV 256
 1540 CALL tankcheck:VAR%=?&79
 1550 IF VAR%=0:ENDPROC
 1560 IF VAR%>1 GOTO 1590
 1570 IF VAR%=1:DIR%=-1:REPEAT:DIR%=DIR%+1:IF DIR%=4 THEN ENDPROC
 1580UNTIL ?(DIR%+&5050)=1:PROCnewdirect:ENDPROC
 1590 A%=?(I%+2)+4:IF A%>7 A%=A%-8
 1600 ?(&5050+(A%/2))=0
 1610 A%=INT(RND(4))+&504F:IF ?(A%)=1 DIR%=(A%-&5050):PROCnewdirect:ENDPROC ELSE GOTO1610

 1620
 1630 DEFPROCnewdirect
 1640 A%=?(I%+2)/2
 1650 IF A%-DIR%=2 OR DIR%-A%=2 ?(I%+4)=4:ENDPROC
 1660 IF A%=3 AND DIR%=0 ?(I%+4)=102:ENDPROC
 1670 IF A%=0 AND DIR%=3 ?(I%+4)=2:ENDPROC
 1680 IF A%-DIR%>0 ?(I%+4)=2:ENDPROC
 1690 IF A%-DIR%<0 ?(I%+4)=102:ENDPROC
 1700 ENDPROC
 1710
 1720 DEFPROCgame
 1730 TIME=0
 1740 PROCshell
 1750 PROCenemyshell
 1760 PROCtank
 1770 PROCenemyshell
 1780 PROCshell
 1790 PROCenemytanks
 1800 REPEAT UNTIL TIME>35
 1810 PRINTTAB(5,2);"SCORE=";SCORE%
 1820 IF SCORE%>HI% HI%=SCORE%
 1830 PRINTTAB(5,1);"HI-SCORE=";HI%
 1840 ENDPROC

 1850
 1860 DEFPROCmachinecode
 1870 FOR pass=0 TO 2 STEP 2
 1880 P%=&5100
 1890 [
 1900 OPT pass
 1910 .move
 1920 LDY #&18
 1930 .loop
 1940 DEY:LDA(&70),Y:ORA(&72),Y:STA(&72),Y:CPY#0:BNE loop:RTS

 1950
 1960 .control
 1970 LDA &74:STA &70:LDA &75:STA &71:JSR move:LDA &76:STA &70:LDA &77:STA &71:JSR move:LDA &74:CLC:ADC #&18:STA &74:LDA &75:ADC #&0:STA &75:LDA &76:CLC:ADC #&18:STA &76:LDA &77:ADC #&0:STA &77:LDA &72:CLC:ADC #&40:STA &72
 1980 LDA &73:ADC #&1:STA &73
 1990 LDA &74:STA &70:LDA &75:STA &71:JSR move:LDA &76:STA &70:LDA &77:STA &71:JSR move:LDA &74:CLC:ADC #&18:STA &74:LDA &75:ADC #&0:STA &75:LDA &76:CLC:ADC #&18:STA &76:LDA &77:ADC #&0:STA &77:LDA &72:CLC:ADC #&40:STA &72
 2000 LDA &73:ADC #&1:STA &73:LDA &74:STA &70:LDA &75:STA &71:JSR move:LDA &76:STA &70:LDA &77:STA &71:JSR move:RTS
 2010
 2020 .blank
 2030 LDX #&3
 2040 .count
 2050 LDY #&18
 2060 .b_loop
 2070 DEY:LDA #&0:STA (&72),Y:CPY #&0:BNE b_loop:DEX:CPX #&0:BEQ exit:LDA &72:CLC:ADC #&40:STA &72:LDA &73:ADC #&1:STA &73:JMP count
 2080 .exit:RTS
 2090
 2100 .check
 2110 LDX #&3
 2120 .c_count
 2130 LDY #&18
 2140 .c_loop
 2150 DEY:LDA (&72),Y:BNE found:CPY #&0:BNE c_loop:DEX:CPX #&0:BEQ c_exit:LDA &72:CLC:ADC #&40:STA &72:LDA &73:ADC #&1:STA &73:JMP c_count
 2160 .c_exit:LDA #&0:STA &78:RTS
 2170 .found:LDA #&1:STA &78:RTS

 2180
 2190 .shellcheck
 2200 LDY #&8
 2210 .s_loop
 2220 DEY:LDA (&72),Y:BNE s_found:CPY #&0:BNE s_loop:LDA #&0:STA &78:RTS
 2230 .s_found:LDA #&1:STA &78:RTS
 2240
 2250 .buffer
 2260 LDX #250:LDA #&80:JSR &FFF4:STX &79:RTS
 2270
 2280 .tankcheck
 2290 LDA #0:STA &79:LDA &7C:SEC:SBC #&C8:STA &72:LDA &7D:SBC #&3:STA &73:JSR check:JSR block:LDA &7E:STA &5050
 2300 LDA &7C:SEC:SBC #&18:STA &72:LDA &7D:SBC #&0:STA &73:JSR check:JSR block:LDA &7E:STA &5053
 2310 LDA &7C:CLC:ADC #&C0:STA &72:LDA &7D:ADC #&3:STA &73:JSR check:JSR block:LDA &7E:STA &5052
 2320 LDA &7C:CLC:ADC #&18:STA &72:LDA &7D:ADC #&0:STA &73:JSR check:JSR block:LDA &7E:STA &5051:RTS

 2330
 2340 .block
 2350 LDA &78:BEQ nought:LDA #&0:STA &7E:RTS
 2360 .nought:LDA #&1:STA &7E:LDX &79:INX:STX &79:RTS

 2370
 2380 .moveshell
 2390 LDY #1:LDA(&70),Y:CMP #5:BMI  right:LDY #2:LDA (&70),Y:STA &73:DEC &73:LDA &73:STA (&70),Y
 2400 .right:LDY #1:LDA(&70),Y:CMP #&4:BPL up:CMP #0:BEQ up:LDY #2:LDA(&70),Y:STA &73:INC &73:LDA &73:STA(&70),Y
 2410 .up:LDY #1:LDA(&70),Y:CMP #2:BMI moveup:CMP #7:BPL moveup:JMP down
 2420 .moveup:LDY #3:LDA(&70),Y:STA &73:DEC &73:LDA &73:STA(&70),Y
 2430 .down:LDY #1:LDA(&70),Y:CMP #3:BMI end:CMP #6:BPL end:LDY #3:LDA(&70),Y:STA &73:INC &73:LDA &73:STA(&70),Y
 2440 .end:RTS

 2450
 2460 .lives
 2470 LDA &74:STA &7C:LDA &75:STA &7D:LDA &76:STA &7E:LDA &77:STA &7F
 2480 LDA #&E8:STA &72:LDA #&58:STA &73:JSR blank:LDA #&E8:STA &72:LDA #&58:STA &73:JSR control:LDA &7C:STA &74:LDA &7D:STA &75:LDA &7E:STA &76:LDA &7F:STA &77
 2490 LDA &80:CMP #2:BEQ nolives:LDA #0:STA &72:LDA #&59:STA &73:JSR blank:LDA #0:STA &72:LDA #&59:STA &73:JSR control:RTS
 2500 .nolives:RTS
 2510 ]
 2520 NEXT
 2530 ENDPROC
 2540
 2550 DEFPROCexplosion
 2560 X%=C%*32+48:Y%=1023-(D%*32+48)
 2570 SOUND 0,-15,6,10:SOUND 0,-15,5,15:SOUND 0,-8,6,5
 2580 FOR LOOP%=1 TO 2
 2590 FOR CIRCLE%=0 TO 500 STEP 60
 2600 N%=CIRCLE%*(PI/6):A%=X%+120*COS(RAD(N%)):B%=Y%+150*SIN(RAD(N%)):MOVE X%,Y%:PLOT 6,A%,B%:MOVE X%,Y%:A%=X%-(A%-X%):B%=Y%-(B%-Y%):PLOT 6,A%,B%:NEXT
 2610 NEXT LOOP%
 2620 PROCclear
 2630 ENDPROC

 2640
 2650 DEFPROCenemyshell
 2660 FOR I%=&5060 TO &5068 STEP 4
 2670 IF ?I%=0 NEXT:ENDPROC
 2680 PRINTTAB(?(I%+2),?(I%+3));" "
 2690 PROCmoveshell
 2700 IF G%<=?(I%+2) AND G%+2>=?(I%+2) AND H%<=?(I%+3) AND H%+2>=?(I%+3) C%=G%:D%=H%:PROCexplosion:GOTO 110
 2710 C%=?(I%+2):D%=?(I%+3):PROCshellcheck:IF ?&78=1 ?I%=0:NEXT:ENDPROC
 2720 PRINTTAB(?(I%+2),?(I%+3));CHR$(226):NEXT:ENDPROC
 2730
 2740 DEFPROCshellcheck
 2750 E%=(D%*320)+(C%*8)+&5800:?&72=E% MOD 256:?&73=E% DIV 256:CALL shellcheck:ENDPROC
 2760
 2770 DEFPROCmoveshell
 2780 ?&70=I% MOD 256:?&71=I% DIV 256:CALLmoveshell
 2790 ENDPROC

 2800
 2810 DEFPROCnewlife
 2820 RESTORE 2840
 2830 IF LIVES%=1 THEN PRINTTAB(15,16);"GAME OVER":TIME=0:REPEAT UNTIL TIME>500:GOTO50 ELSE CLS:PROCscreen:LIVES%=LIVES%-1
 2840 DATA 5,29,13,6,29,13,6,28,13,6,27,13,6,26,13,5,26,13,4,26,14,4,26,15,4,26,16,5,26,16,6,26,16,7,28,16,8,28,16
 2850 LOC%=&5700
 2860 FOR D%=0 TO 12:C%=29:A%=2:B%=18:PROCdraw:TIME=0:REPEAT:CALL buffer:IF?&79>4 AND ?LOC%<>1 SOUND 1,-15,?LOC%,?(LOC%+1):SOUND 1,0,0,2:LOC%=LOC%+2:UNTIL TIME>37:PROCclear:NEXT ELSE UNTIL TIME>37:PROCclear:NEXT
 2870 FOR I%=1 TO 11:READ A%,C%,D%:B%=?(&5010+A%):A%=?(&5000+A%):PROCdraw:TIME=0:REPEAT:CALL buffer:IF?&79>4 AND ?LOC%<>1 SOUND 1,-15,?LOC%,?(LOC%+1):SOUND 1,0,0,2:LOC%=LOC%+2:UNTIL TIME>37:PROCclear:NEXT ELSE UNTIL TIME>37:PROCclear:NEXT
 2880 FOR C%=26 TO 21 STEP -1:D%=16:A%=3:B%=19:PROCdraw:TIME=0:REPEAT:CALL buffer:IF?&79>4 AND ?LOC%<>1 SOUND 1,-15,?LOC%,?(LOC%+1):SOUND 1,0,0,2:LOC%=LOC%+2:UNTIL TIME>40:PROCclear:NEXT ELSE UNTIL TIME>40:PROCclear:NEXT
 2890 FOR I%=1 TO 2:READ A%,C%,D%:B%=?(&5010+A%):A%=?(&5000+A%):PROCdraw:TIME=0:REPEAT:CALL buffer:IF?&79>4 AND ?LOC%<>1 SOUND 1,-15,?LOC%,?(LOC%+1):SOUND 1,0,0,2:LOC%=LOC%+2:UNTIL TIME>40:PROCclear:NEXT ELSE UNTIL TIME>40:PROCclear:NEXT
 2900 PROCclear:A%=0:B%=16:PROCdraw:PROCscreen:ENDPROC
 2910
 2920 DEFPROCshell
 2930 FOR I%=&5070 TO &5075 STEP 4:IF ?I%=0 NEXT:ENDPROC
 2940 IF G%<=?(I%+2) AND G%+3>?(I%+2) AND H%<=?(I%+3) AND H%+3>?(I%+3):GOTO 2950 ELSE PRINTTAB(?(I%+2),?(I%+3));" "
 2950 PROCmoveshell
 2960 FOR L%=&5030 TO &504F STEP 8:IF ?(L%+6)<=?(I%+2) AND ?(L%+6)+2>=?(I%+2) AND ?(L%+7)<=?(I%+3) AND ?(L%+7)+2>=?(I%+3) AND ?L%=1 C%=?(L%+6):D%=?(L%+7):PROCexplosion:SCORE%=SCORE%+100:?L%=0:?I%=0:NEXT L%:NEXT I% ELSE NEXT L%
 2970 C%=?(I%+2):D%=?(I%+3):PROCshellcheck:IF ?&78=1 ?I%=0:NEXT:ENDPROC
 2980 IF ?I%=1 PRINTTAB(?(I%+2),?(I%+3));CHR$(226):NEXT:ENDPROC
 2990 NEXT:ENDPROC

 3000
 3010 DEFPROCinstructions
 3020 PRINTTAB(9,2);CHR$(131);CHR$(141);"TANKS by N.Sheard":PRINTTAB(9,3);CHR$(131);CHR$(141);"TANKS by N.Sheard"
 3030 PRINTTAB(9,4);CHR$(134);CHR$(146);"****************"
 3040 PRINTTAB(5,7);CHR$(130);"SCORE=";SCORE%:PRINTTAB(23,7);"HI-SCORE=";HI%
 3050 PRINTTAB(11,10);CHR$(131);CHR$(141);"INSTRUCTIONS":PRINTTAB(11,11);CHR$(131);CHR$(141);"INSTRUCTIONS":PRINTTAB(11,12);CHR$(134);CHR$(146);"*************"
 3060 PRINTTAB(9,14);CHR$(134);"Guide your tank using:-"
 3070 PRINTTAB(8,16);CHR$(134);"'Z'-ROTATE CHASSIS LEFT.":PRINTTAB(8,17);CHR$(134);"'X'-ROTATE CHASSIS RIGHT.":PRINTTAB(8,18);CHR$(134);"','-ROTATE TURRET LEFT.":PRINTTAB(8,19);CHR$(134);"'/'-ROTATE TURRET RIGHT."
 3080 PRINTTAB(8,20);CHR$(134);"'(space bar)'-ACCELERATE.":PRINTTAB(8,21);CHR$(134);"'(shift)'-FIRE."
 3090 PRINTTAB(6,23);CHR$(136);CHR$(131);CHR$(157);CHR$(132);"PRESS ANY KEY TO START  ";CHR$(156)
 3100 *FX15,1
 3110 TIME=0:REPEAT UNTIL TIME>100:G=GET:SCORE%=0:ENDPROC
 3120 END
```

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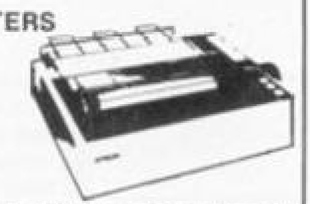
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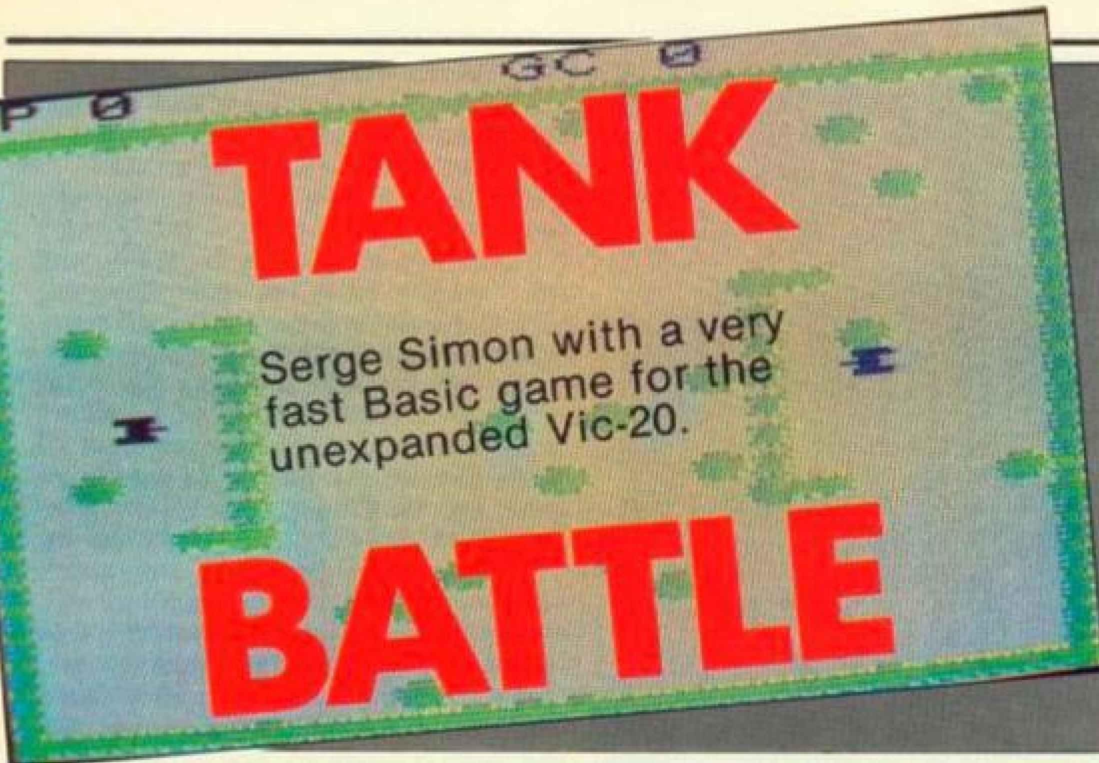
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Interface

TANK BATTLE

Serge Simon with a very fast Basic game for the unexpanded Vic-20.



AS REGULAR readers of *Your Computer* can see, machine code is used more and more for writing games. Such programs are much faster and more sophisticated than Basic programs, but are they better? Typing in those programs, mostly consisting of endless data lines is not a pleasant task, and for beginning computer enthusiasts it may be very discouraging. Also it seems as if people have forgotten that in Basic too, one can write good and reasonable fast games.

Therefore I have written this 100 per cent Basic program. It is Tank Battle, a two-player game for the unexpanded Vic-20. The program starts with displaying a title page, where you will be asked to enter the names of the two players.

If you have done this, and you have hit Return, you can see a sort of map on the screen, and two tanks.

The two players can move around the tanks and they can fire in the direction they move. The aim is — naturally — *to destroy the* other's tank and to score points. The keys to be used are:

For player one (black tank)
forward, Ctrl; turn, Shift; and fire, CBM
For player two (blue tank)
forward, £5; turn, £7; and fire, £3

The game itself is divided into two parts because of the limited memory of the standard Vic-20. First type in the program with the data statements for the user defined graphics. Then save it and type in the second part. Save this immediately after the first one. If you later load in the first program, the main program will be loaded automatically.

One last note: player one, who sits at the left side, may accidentally hit the Run-Stop key and thus break into the program. To prevent this add line:

```
2 POKE 45, 240: POKE 46, 26: POKE 788, 194
```

Program 1.

```
0 POKE52,28:POKE56,28:POKE36879,152
1 REM ****************      * TANK BATTLE *      * SERGE SIMON *      ****************
5 PRINT"     TANK BATTLE     "
6 PRINT"    -MADE BY  SERGE SIMON-"
10 PRINT"    UDG S...PLEASE WAIT..."
20 C=0:FORI=7168TO7679
30 READA:IFA=-1THEN51
40 POKEI,A:C=C+A
50 NEXTI
51 IFC<>12528THENPRINT"ERROR IN DATA"
55 FORT=7168+256TO7168+256+8:POKET,0:NEXT
60 POKE198,0:POKE198,1:POKE631,131:NEW
90 DATA0,0,0,0,0,0,0,0
99 REMTANKS************
100 DATA16,16,214,254,254,254,198,198
110 DATA25,50,124,253,191,30,12,24
120 DATA0,252,252,56,63,56,252,252
130 DATA24,12,30,191,253,124,50,25
140 DATA198,198,254,254,254,214,16,16
150 DATA24,48,120,253,191,62,76,152
160 DATA63,63,28,252,28,63,63,0
170 DATA152,76,62,191,253,120,48,24
171 REMEND OF TANKS***
180 DATA0,54,126,62,60,126,124,20
190 DATA0,109,255,255,255,255,76,0
191 DATA60,126,255,255,255,255,126,60
192 DATA0,0,0,24,24,0,0,0
193 DATA129,90,36,90,90,36,90,129
194 DATA124,60,126,120,60,124,126,60
300 DATA-1
```

```
0 PRINT"":V=36878:POKEV+1,152
1 FORT=1TO8:READR(T):NEXT:DATA-22,-21,1,23,22,21,-1,-23
5 PRINTCHR$(8)CHR$(142)
10 REM   TANKGEVECHT*   *DOOR SERGE SIMON *   *VLAANDEREN,BELGIE*
40 PRINT"     TANK  BATTLE   "
41 PRINT"    BY SERGE SIMON"
45 PRINT"    PLAYER 1 CBM/SHFT/CTRLPLAYER 2 FUNCTION KEYS"
46 PRINT"    GIVE NAME OF"
50 INPUT"PLAYER 1";B$:IFLEN(B$)>6THENB$=LEFT$(B$,6)
60 INPUT"PLAYER 2";A$:IFLEN(A$)>6THENA$=LEFT$(A$,6)
65 PRINT""
69 REM SETUP SCREEN***
70 POKE36869,255
71 FORT=44TO484:POKE38400+T,0:NEXT
75 PRINT"   KJJKJJJJJKJJJJJJJJJKJJK";
76 FORT=1TO20:PRINT"N"SPC(20)"N";:NEXT
77 PRINT"KJJJJKJJJKJKJJJJJKJJK";:PRINTCHR$(157)CHR$(148)"J";
80 FORT=0TO20:P=RND(1)*484+22:POKE38400+P,5:POKE7680+P,11:NEXT
85 PRINT"         "SPC(4)"JK           JK"
86 PRINT"         "SPC(15)"KJ            KJ"
87 PRINT"   "B$,0,"  "A$,0
89 REM END SCREEN*****
90 PB=7680+3+242:PA=7680+17+242:POKEPB,3:POKEPA,7:RA=7:RB=3:POKEPB+30720,0
91 POKEPA+30720,6
95 KL=152:POKEV,10:TI$="000000"
96 MS=30:REM NUMBER OF BULLETS FOR EACH PLAYER
99 REM TANK 1**********
100 A=PEEK(197)
101 IFA=63THENGOTO110
102 IFA=55THEN120
103 IFA=47ANDAS<MSTHEN130
104 POKEV-3,0:GOTO199
110 RA=RA+1:IFRA=9THENRA=1
111 POKEPA,RA:POKE30720+PA,6:GOTO199
120 POKEV-3,255:POKEPA,32:PA=PA+R(RA):IFPEEK(PA)<>32THENPA=PA-R(RA)
122 POKEPA,RA:POKEPA+30720,6:GOTO199
130 AS=AS+1:C=2:S=220:PK=PA:R=RA:Q=RB:GOSUB500:GOTO200
189 REM TANK 2**********
199 FORT=0TO25:NEXT
200 B=PEEK(653)
201 IFB=1THEN210
202 IFB=4THEN220
203 IFB=2ANDBS<MSTHEN230
204 POKEV-4,0:GOTO299
210 RB=RB+1:IFRB=9THENRB=1
211 POKEPB,RB:POKE30720+PB,0:GOTO299
220 POKEV-4,255:POKEPB,32:PB=PB+R(RB):IFPEEK(PB)<>32THENPB=PB-R(RB)
222 POKEPB,RB:POKE30720+PB,0:GOTO299
230 BS=BS+1:C=6:S=200:PK=PB:R=RB:Q=RA:GOSUB500:GOTO300
299 FORT=0TO25:NEXT
300 IFTI$<"000140"THEN100
310 KL=-(KL=152)*168-(KL=168)*152:POKE36879,KL
315 IFTI$<"000150"THEN100
316 PRINT"":POKE36869,240:POKEV+1,152
319 POKEV-1,0:POKEV-4,0:POKEV-3,0
320 PRINT"              SCORE"
321 PRINT"        (1)"B$,BB
322 PRINT"        (2)"A$,AA
323 PRINT"         PRESS KEY £"
330 GETA$:IFA$<>"£"THEN330
340 RUN
399 REM FIRE **********
500 POKEV-1,200:POKEV-4,180
510 FORT=1TO15
520 P=PK+T*R(R):IFPEEK(P)<>32THEN550
530 POKEP,12:POKEV-1,S-T*4+10:POKEV-4,S-T*4:POKEP,32
540 NEXT
545 POKEV-1,0:POKEV-4,0:POKEV,10:RETURN
550 IFPEEK(P)>8THEN545
560 POKEP,13:POKEV-1,140:POKEV-4,0:FORT=15TO0STEP-.2:POKEV,T:POKE30720+P,2-(RND(1)>.5)*2
563 NEXT
570 IFPA=PTHENBB=BB+1:RA=RA+3:RA=RA-(RA>8)*8:POKEP,RA
580 IFPB=PTHENAA=AA+1:RB=RB+3:RB=RB-(RB>8)*8:POKEP,RB
590 PRINT"   "B$,BB"  "A$,AA:POKE30720+P,C:GOTO545
```

Loader.

```
  1 POKE 23693,7: BORDER 0: CLE
AR 23999: LOAD ""CODE : LOAD ""C
ODE : PRINT "HIT ANY KEY..";USR 
30069
```

The hex loader.

```
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  20 INPUT "Start ";s
  30 INPUT "Finish ";f
  40 FOR n=s TO f STEP 8
  50 LET tot=0: PRINT n;": ";
  60 INPUT h$: PRINT h$;
  70 LET x=0
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM enter STOP to stop
```

Listing 1.

```
23296: 2A15012404012509 = 151
23304: 0325111C1D0C1E00 = 156
23312: 0906060C061F0D1E = 113
23320: 19140E191411260C = 171
23328: 1826041E27121127 = 209
23336: 121D05090F1E1506 = 133
23344: 2F111E2D080F2B08 = 213
23352: 1828151E23041E23 = 219
23360: 141E290D0102090A = 126
23368: 210911150F180E0D = 146
23376: 09080A0F170B100D = 105
23384: 0C0D07050A140D0F = 95
23392: 0000000000000000 = 0
23400: 0000000000000000 = 0
23408: 0000000000000000 = 0
23416: 000000E95B2A7B5B = 580
23424: 2377227B5BC92A7B = 768
23432: 5B7EA7C82B227B5B = 875
23440: 6F5F0E023E10D3FE = 765
23448: 2D2003EE106B10F6 = 703
23456: 0D20F3AFD3FEC90F = 1144
23464: 0B0200B45B00032B = 330
23472: 051B061B061B0F05 = 118
23480: 9008000000000000 = 152
23488: 0000000000000000 = 0
23496: 0000000000000000 = 0
23504: 261E221904040311 = 155
23512: 048407040000E4E8 = 607
23520: D3241C140C04130B = 341
23528: 03ED5FAE0707ED4F = 839
23536: E61FC90107000000 = 470
23544: 0000000000000000 = 0
```

SNAKES ALIVE is a 100 per cent machine-code game for any Spectrum which just fills all the memory available to the 16K machine. It features:

- 48 locations, which you are free to move between and around, and each of which is named.
- Choice of control by Kempston-type joystick, cursor type, Interface II or redefinable keyboard.
- Title screen with music, scrolling instructions and display of
- High-score table.
- Annoying addictiveness that makes you unable to stop playing!

The object of the game is to guide Kahn the snake around a house and its grounds to find and collect nine eggs which he has lost. It is totally non-violent — your poor snake is absolutely defenceless — which doesn't matter as there is nothing else about. The worst thing that can happen to Kahn is either bumping into an object, which results, in a nasty headache, or tying himself in knots. Despite Kahn being the only character that moves, the game is still frustratingly difficult.

On a blank cassette, save the loader program. This will load in the final code:

SAVE "SNAKES II"LINE I

Type in the hex loader carefully. Save this on the other cassette, in case you don't type in all the hex in one go, or need to check it later.

Now Run the hexloader, type in the code from listing 1, and save the resultant code on the cassette with the loader, using:

SAVE "PRBF" CODE 23296,256

Run the hex loader again, and this time enter data from listing 2. Once finished, type:

SAVE "CODE II"CODE 28384,4384

This code should not be saved on the final cassette.

Repeat this exactly, except type in code from listing 3. It may be saved temporarily with the same save instruction as before. When you have typed in this code, type:

CLEAR 23833: NEW and then

CLEAR 23999: LOAD""CODE 2400

Load in the code from listing 2. Save the whole code on the finished cassette of the game, after the PRBF file, with:

SAVE "TOTAL"CODE 24000,8768

Summon up enough courage to try out the game — type Load"" and cross your fingers. If the game does not work perfectly first time, the most likely mistake that could have been made is that of entering one or more lines of hex data twice, or missing out others. The checksum is likely to stop other possible errors, but may not have. The only solution, short of starting again from scratch, is to list the program from the hexloader, by loading in relevant sections of code. As a guideline — if the program when tested crashes straight away, the error is likely to be within the code typed in from listing 2.

SNA

Listing 2.

```
[illegible]
```

If it is during the game that an error becomes apparent, then look at the hex from listing 3. If, however, it is some mistake with the sound effects, or egg positioning, then check the code from listing 1.

Once the game has loaded, and works successfully, after pressing a key you will be shown the title screen to the game and some quite lengthy, but good, music will play. If this ends or is interrupted by a key press, the scrolling instructions will move slowly along the bottom line. Pressing S or O now will start or take you to the control options screen, respectively. On the control option screen, scrolling instructions again tell you which keys to press: 1 is keyboard, 2 — cursor joystick, 3 — Interface II joystick and 4 — Kempston-type joystick. The current choice is highlighted in white — the others in cyan.

I can supply tapes of the game, with both a turbo load — yes, in 16K! — and a normal load version of the game on, for only £2.75 inc. from: Snakes Alive, 16 Viking Way, Pilgrims Hatch, Brentwood, Essex, CM15 9HX. If you would also like a copy of my other game, Aliquid Simplex, published in *Your Computer* in November of last year, which includes sprites, two-channel music, etc., then I will put this on the same tape for you for another £1. Europe please add £1, overseas an extra £2.



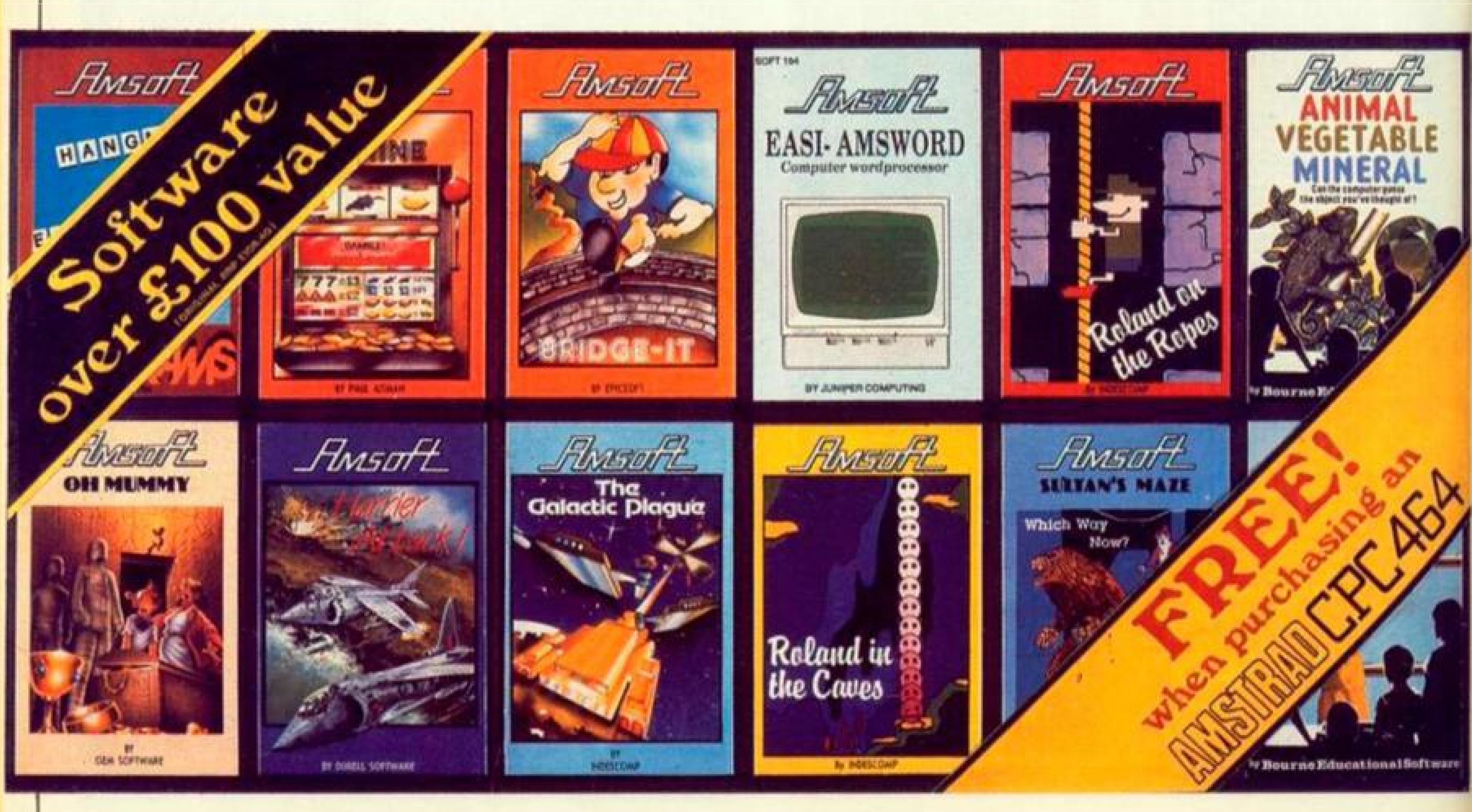
David Aspinall presents a totally non-violent but, nevertheless exciting, game for the Spectrum featuring Kahn the snake.

AKES ALIVE

```
30416 : 2045474753205748 = 517
30424 : 494348204B41484E = 534
30432 : 20484153204C4F53 = 522
30440 : 542E205748454E20 = 500
30448 : 414C4C2045474753 = 543
30456 : 2048415645204245 = 491
30464 : 454E20464F554E44 = 559
30472 : 2C2052455455524E = 556
30480 : 20544F2054484520 = 484
30488 : 5354415254494E47 = 620
30496 : 204C4F434154494F = 555
30504 : 4E2E2E2E2041564F = 478
30512 : 4944205459494E47 = 568
30520 : 204B41484E20494E = 505
30528 : 204B4E4F5453204F = 542
30536 : 5220464154414C20 = 506
30544 : 434F4C4C4953494F = 606
30552 : 4E53205749544820 = 541
30560 : 414E595448494E47 = 610
30568 : 20454C53452E2020 = 439
30576 : 202D2020202D2D50 = 343
30584 : 52455353204F2046 = 530
30592 : 4F522047414D4520 = 507
30600 : 4F5054494F4E532C = 600
30608 : 204F52205320544F = 503
30616 : 2053544152542020 = 494
30624 : 202020203B3C3D40 = 372
30632 : 2020202020860047 = 365
30640 : 2041204D20452020 = 371
30648 : 204F205020542049 = 444
30656 : 204F204E20D03D20 = 554
30664 : 202D2D2D2D2D2020 = 321
30672 : 2D2D2D2D2D2D2D2D = 360
30680 : 2D2D2D2DA04B4559 = 573
30688 : 424F4152442C2041 = 501
30696 : 532042454C4FD743 = 687
30704 : 5552534F52204A4F = 596
30712 : 5953544943CB494E = 750
30720 : 5445524641434520 = 538
30728 : 49C94B454D505354 = 742
30736 : 4F4E204A4F595354 = 598
30744 : 4943CB2650080E06 = 489
30752 : 202EFFAFCB162D10 = 794
30760 : FB240D20F2FB76F3 = 1186
30768 : C921E15A11E25A01 = 883
30776 : 1C0077EDB0C9CDA1 = 1127
30784 : 75CDAD653E1FCD31 = 943
30792 : 7811AD7721000422 = 500
30800 : A95BCD33662C2604 = 704
30808 : 22A95BCD33660604 = 662
30816 : 3AD85BBB3E052002 = 653
30824 : 3E0732A75BF64008 = 695
30832 : 26052C2C22A95BEB = 660
30840 : C5E516013E3590CD = 913
30848 : 5265D1CD3366C110 = 959
30856 : D7110E00CDD76A00 = 772
30864 : 044B4559424F4152 = 529
30872 : 4420434F4E54524F = 569
30880 : 4C53204E4F572044 = 535
30888 : 4546494E45442041 = 524
30896 : 5300003A02111032 = 333
30904 : A95B21C058006011 = 619
30912 : E850C5E5CD3366E1 = 1334
30920 : D55E23E5A7CD977B = 1217
30928 : CD1D677CEE10E610 = 961
30936 : F60367E61020022C = 676
30944 : 2C22A95BE1D1C110 = 981
30952 : D921D975A7C30079 = 1080
30960 : 4F3E359132D85BCD = 904
30968 : A175C34978CD9E6A = 1135
30976 : 3E00C01CC81D5721 = 631
30984 : 0502197EC922DC5B = 704
30992 : 1732015CE8AF08CD = 917
31000 : 1B78D5CDFD78D14F = 1226
31008 : 3A815C1F79300CFE = 745
31016 : 53CA3375FE4FCA3E = 1050
31024 : 7B1813FE52CA2C78 = 868
31032 : FE0DCA9275FE3138 = 1091
31040 : 05FE35DAF0781AE6 = 1146
31048 : 7F6F260029292901 = 400
31056 : 007D09094F080608 = 243
31064 : C5EB21FF50C5793C = 1194
31072 : 471A0710FDE601B6 = 786
31080 : 772413C110EFC118 = 839
31088 : 3CE60720A1081A13 = 543
31096 : C87F20902ADC5B10 = 902
31104 : 93CDAD6521007D22 = 818
31112 : 6B653E0632A75B11 = 601
31120 : C178AF32FB792100 = 946
31128 : 0022A95BCDF4793E = 926
31136 : 0232FB793E0532A7 = 708
31144 : 5B11347C21060222 = 359
31152 : A95BCDF4791E0D0E = 887
31160 : 0521C05DE5216875 = 889
31168 : 3E4732A75B060816 = 477
31176 : 0AE3CDE57910FB14 = 1079
31184 : 14E30606CDE57910 = 830
31192 : FB1C1C3E4432A75B = 745
31200 : 0D20E2F1C97EEBD5 = 1287
31208 : C522A95BCD1D67EB = 1063
31216 : C1E123C9CD33661A = 1038
31224 : 3CC826052C22A95B = 641
31232 : 18F211BB750E05D5 = 819
31240 : 0B0621D6651ABE23 = 616
31248 : 13200710F8F10D20 = 608
31256 : EEC9D13807210600 = 750
31264 : 19EB18F2C50000C5 = 942
31272 : 00281E0C21D27511 = 472
31280 : D87579878781814F = 1061
31288 : EDB8C1C5E210FB11 = 1177
31296 : E75D798787874FED = 1166
31304 : B0C1D121C8653E06 = 1007
31312 : 910E06EDB021BB75 = 915
31320 : 1116660E06EDB021 = 607
31328 : B85D0E08093D20FC = 653
31336 : E5CDAD65110700CD = 937
31344 : D76A000620205745 = 547
31352 : 4C4C20444F4E4521 = 511
31360 : 212059 4F55204841 = 487
31368 : 5645204143484945 = 533
31376 : 5645442020204F4E = 476
31384 : 45204F4620544845 = 507
31392 : 2046495645204849 = 507
31400 : 4748455354202020 = 475
31408 : 2020202020205343 = 342
31416 : 4F52455320544F44 = 576
31424 : 41592E2E2E2E2E2E = 430
31432 : 2020202020202020 = 256
31440 : 202020200000504C = 288
31448 : 4541534520545950 = 571
31456 : 4520594F5552204E = 546
31464 : 414D453A0047A0E1 = 725
31472 : 0608E5C5CDA17537 = 978
31480 : CD187B3C28F630FE = 1016
31488 : 0D280EF5CD1D67F1 = 890
31496 : C1E1772310E4C3A1 = 1172
31504 : 75C1E136202310FE = 923
31512 : C3A17508CDA17520 = 996
31520 : FBCD9E6A20F61C28 = 1066
31528 : FB1D186C21C05B08 = 747
31536 : 04C5E5C5CDA175CD = 1315
31544 : AD65110802CDD76A = 827
31552 : 0045500524555320 = 498
31560 : 5245515549524544 = 609
31568 : 204B455920464F52 = 528
31576 : 3AADC1210E0A22A9 = 684
31584 : 5B11E85D3E0490CD = 848
31592 : 3866A7CD1B78E1C1 = 1090
31600 : 73545048003E0590 = 583
31608 : 471A0052000B288E = 415
31616 : F9EB4118ACD5C508 = 1163
31624 : CD1D67C141E12310 = 871
31632 : A0CDA175C33E7808 = 1028
31640 : 2105021600197E21 = 246
31648 : B57B0604BE200423 = 583
31656 : 10FAC90104000908 = 489
31664 : 3001097EC9E30D0E = 639
31672 : 2014151617FF0DFF = 641
31680 : 2027222220272229 = 285
31688 : 2027222220262026 = 285
31696 : 20272222202722A3 = 408
31704 : 2222202022222220 = 282
31712 : 223E2220222A2220 = 304
31720 : 222F202022A85022 = 473
31728 : 2020222022222222 = 272
31736 : 2220222258202222 = 325
31744 : 23205022A8202F22 = 475
31752 : 2022222022222922 = 273
31760 : 2022222022202020 = 262
31768 : 20202FA225225E20 = 470
31776 : 2420242024202420 = 272
31784 : 24202420205D2223 = 330
31792 : 2522DEFF2F222020 = 693
31800 : 2620202026262020 = 274
31808 : 262027222320A622 = 410
31816 : 3E22222022202020 = 292
31824 : 2022222022222020 = 273
31832 : 20A2222222202220 = 394
31840 : 2020222022202220 = 262
31848 : 2222223220A22222 = 408
31856 : 2022202020222022 = 262
31864 : 2A22202225822044 = 461
31872 : 24202420205D2223 = 330
31880 : 242050222E225022 = 448
31888 : 2320DCFFF0000420 = 825
31896 : 49CE41D44FCE5448 = 997
31904 : C50047415244454E = 630
31912 : 20534845C4014341 = 585
31920 : 4242414745522041 = 514
31928 : 5443C80047524150 = 649
31936 : 452056494E45D303 = 621
31944 : 4C4157CE00484544 = 643
31952 : 47C50046454E43C5 = 749
31960 : 02444F4F52535445 = 546
31968 : D00148414C4C5741 = 650
31976 : D9035354414952D3 = 818
31984 : 0153504152452052 = 494
31992 : 4F4FCD014D41494E = 657
32000 : 204245445 24F4FCD = 680
32008 : 014C4956494E4720 = 490
32016 : 524F4FCD03504154 = 677
32024 : 485741D901424143 = 640
32032 : 4B20424544524F4F = 550
32040 : CD034C414E44494E = 646
32048 : C70142415448524F = 648
32056 : 4FCD004741524147 = 638
32064 : C5015354524545D4 = 797
32072 : 0246524F4E542044 = 495
32080 : 4F4FD200504F4E44 = 673
32088 : 2020202020A00043 = 367
32096 : 4F4D504F53542048 = 586
32104 : 4541D00048454447 = 622
32112 : 45524FD700465255 = 682
32120 : 4954205452454503 = 704
32128 : 0057414CCC025354 = 601
32136 : 5245455420434F52 = 564
32144 : 4E45D20347415244 = 646
32152 : 454E20504154C800 = 608
32160 : 6699888866199966 = 909
32168 : F9898DE880989F90 = 1285
32176 : 6699886611996600 = 765
32184 : 4EA99594E28A8400 = 742
32192 : 2ACDFFC2178619AC = 1098
32200 : 1AA21C991E901F88 = 710
32208 : 2180237928572286 = 615
32216 : 2A652C5F2F593254 = 552
32224 : 354F384638463F42 = 521
32232 : 423E463A4B374F34 = 517
32240 : 5430592E5E2B7D42 = 598
32248 : 3F00A73B0C34FF00 = 959
32256 : 0000000000000000 = 0
32264 : 1818181818001800 = 144
32272 : FF00FF00FF00FF00 = 1020
32280 : F800FE00FE00F800 = 1004
32288 : FF00FF007E003C00 = 696
32296 : 1F007F007F001F00 = 316
32304 : 3C007E00FF00FF00 = 696
32312 : 07003F007F00FF00 = 452
32320 : E000FC00FE00FF00 = 985
32328 : FF00C30081008100 = 708
32336 : 00008100C300C300 = 519
32344 : FC00F0003000F000 = 860
32352 : 0000000018900000 = 168
32360 : 000000007E000000 = 126
32368 : 0000000000303000 = 96
32376 : 3F000F0007001F00 = 116
32384 : 7C868A92A2C27C00 = 1022
32392 : 0818080808081C00 = 92
32400 : 7CC2023C4080FE00 = 826
32408 : 7CC2021C02C27C00 = 668
32416 : 08182848FE080800 = 414
32424 : FC8080FC02C27C00 = 1080
32432 : 3C4080FC82827C00 = 888
32440 : FE02043E08101000 = 362
```

(continued on page 76)

Now Amstrad gives you over £100 to play with.



(continued from page 73)

```
32448  7C82827C82827C00 = 892
32456  7C8282 7E02020200 = 516
32464  0010100000101000 = 64
32472  F8FDCDCDCDFDF900 = 1616
32480  F0F898F8F8989800 = 1440
32488  FFB3AAAB82BAB8FF = 1581
32496  FF00C3000100E700 = 810
32504  7C82820418001000 = 420
32512  FF3505350100300FF = 1320
32520  7C8282FE8282C600 = 1096
32528  FC42427C4242FC00 = 892
32536  7C86808080867C00 = 900
32544  F8444242424 4F800 = 830
32552  FE404078 4040FE00 = 884
32560  FE40407840 40E000 = 854
32568  3C46808E82443800 = 654
32576  C68282FE8282C600 = 1170
32584  7C101010101 07C00 = 328
32592  0E0404 04C4847800 = 474
32600  E24448704844E600 = 848
32608  8080808080 82FE00 = 1024
32616  82C6AA928282C600 = 1102
32624  86C2A29 28A86C200 = 1102
32632  3844828282443800 = 638
32640  FC42427C4040E000 = 860
32648  384482828A443A00 = 648
32656  FC42427C4844E200 = 874
32664  7C86807C02C27C00 = 830
32672  FE92101010103800 = 520
32680  C68282828282 7C00 = 972
32688  C682828244281000 = 712
32696  C682829292542800 = 874
32704  C6442810 2844C600 = 828
32712  C644281010103800 = 410
32720  FE84081020 42FE00 = 762
32728  FC00F000E000F800 = 964
32736  00183C7E7E3C1800 = 420
32744  FF007F003F000700 = 452
32752  FF00FE00FC00E000 = 985
32760  3C66DB8181DB663C = 1116
```

Listing 3.



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Hex dump.

```
[illegible]
```

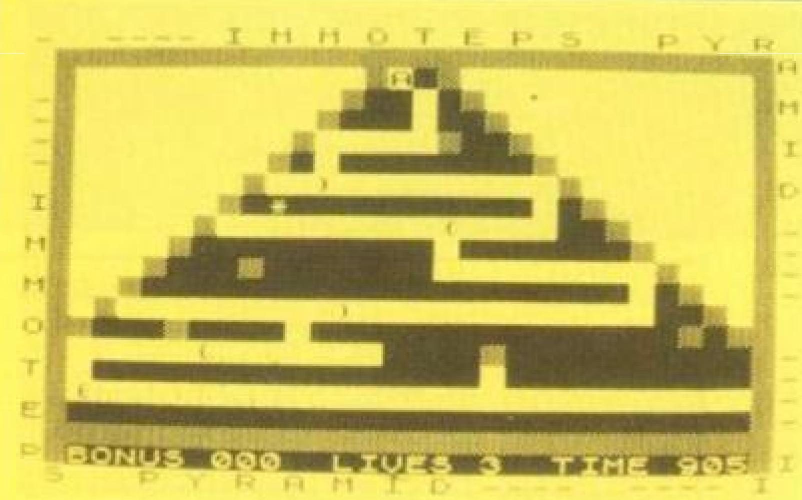
SURV

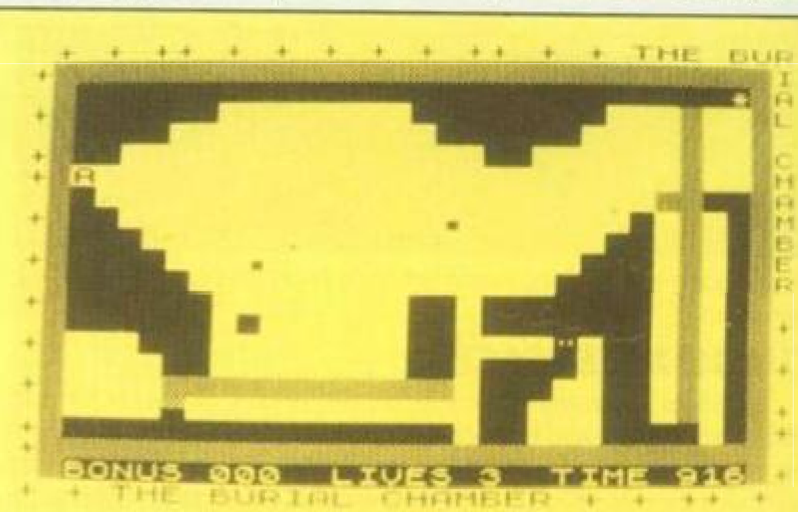
Ádrian Spriddell survives.

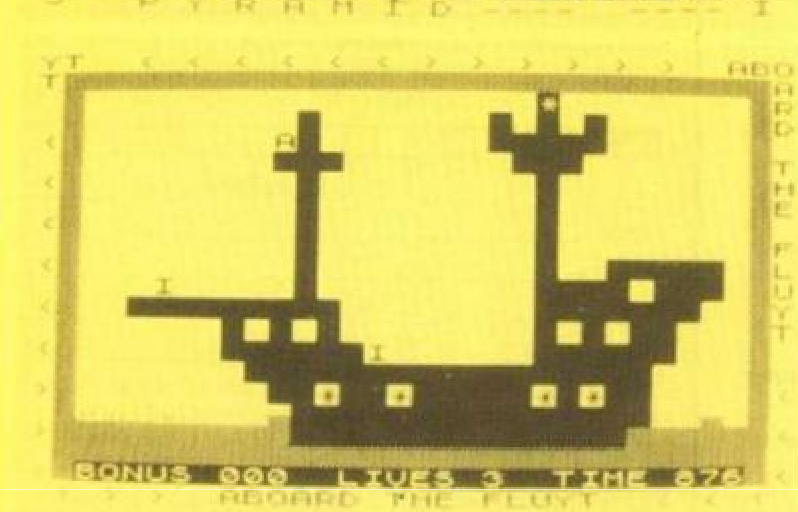
THIS IS A ZX-81 graphic adventure game called Survivor containing 10 levels each with its own different screen display and running in under 5K of machine code including all data. And before you reach for a calculator, I know that it takes 7K to store 10 screens. The discrepancy is due to the effects of Bistromatics, the original program having been written on the back of an old restaurant menu.

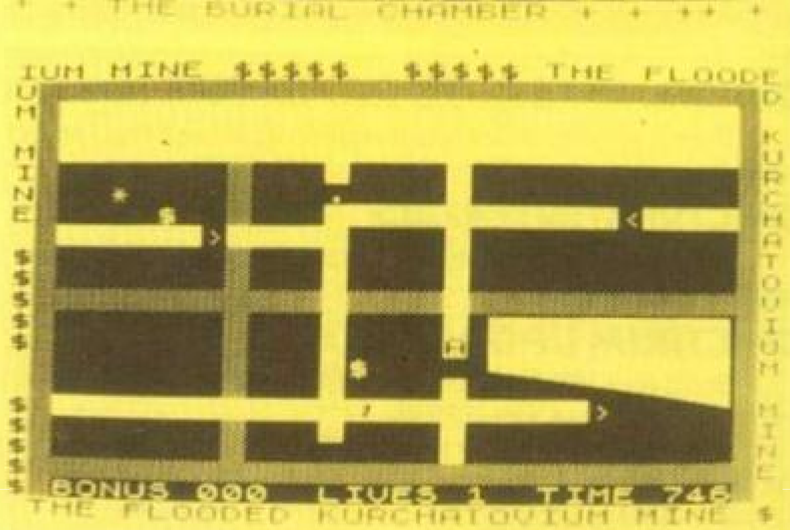
You are a lonely little blue person with short spindly arms having next to no strength so you cannot hang from anything. You are, however, possessed of a pretty good pair of legs — good that is for running and jumping. Unfortunately, the standard ZX-81 graphics set is somewhat limited and most little blue people end up looking suspiciously like a capital A, and on most televisions, worse still a black and white capital A.

You have absolutely no defences or protection. Almost anything in your environment is hostile. In fact, about the only thing that will









```
[illegible]
17802 - 0000000000000000 =0
17810 - 0000000000000000 =0
17818 - 0000000000000000 =0
17826 - 0000000000000000 =0
17834 - 0000000000000000 =0
17842 - 0000000000000000 =0
17850 - 0000000000000000 =0
17858 - 0000000000000000 =0
17866 - 0000000000000000 =0
17874 - 0000000000000000 =0
17882 - 0000000000000000 =0
17890 - 0000000000000000 =0
17898 - 0000000000000000 =0
17906 - 0000000000000000 =0
17914 - 0000000000000000 =0
17922 - 0000000000000000 =0
17930 - 0000000000000000 =0
17938 - 0000000000000000 =0
17946 - 0000000000000000 =0
17954 - 0000000000000000 =0
17962 - 0000000000000000 =0
[illegible]
17970 - 0000000000000000 =0
17978 - 0000000000000000 =0
17986 - 0000000000000000 =0
17994 - 0000000000002187 =168
18002 - [illegible]
[illegible]
```

(listing continued on next page).

VIVOR

not harm you is stepping on the cracks in the pavement.

Apart from flying bricks, arrows, boulders and anti-matter bombs being hurled at you, mummies, ghosts and horrid guards with sharp spears — OK then, dollar signs — are running around and will kill you if they get half a chance.

Not even the ground is safe entirely. Black blocks are OK and may be walked on or through with impunity but anything else black should not be trusted. There are grey seams of old Windscale waste around. These are impenetrable and although not immediately fatal, should you step on one, you will lose 50 health credits and have to start again. Bridges and elevators are there to help you — usually. Keys are: P — left; O — right; Shift — jump.

The object of your endeavours is to reach the inverse star which is the key to the exit. Once this has been achieved you will be awarded 100 points and the exit itself will appear as another inverse star. This is your way through to the next level. Any time points then remaining will be added to your bonus. If you fail to collect a key or reach an exit before the time count reaches zero you will lose a life but will be able to carry on — assuming that was not your last life — where you left off by pressing any key.

Keys Y, H or B will suspend the game while you grab asprin and a coffee. Pressing any other key will restart play.

Type in any 160 characters as line 1. Edit line 1 and change it to line 2. Edit this and change to line 3, etc. until you have lines 1 to 35. Type

POKE 22317,180

and line 35 should end in an inverse letter O. If it does not, a mistake has been made. Now enter as direct commands:

POKE 16510,0
POKE 16511,179
POKE 16512,22

This joins lines 1 to 35 together.

Enter a new line 1:

1 REM *** DO NOT DELETE ***

Make sure that you do not delete it.

Type in the Basic loader/checker from listing 1. Run, enter 16514 as the start address and enter the code from the hex dump one row at a time. Do not attempt to enter the equals sign or the following number. This is a checksum which should tally with what the computer is holding. It will be displayed on pressing N/L after entering every eight bytes. If the two totals are not the same, you have made an error in that line. Enter S to reRun the loader entering the start address of that line in answer to the prompt.

To test the game enter the lines of Basic from listing 2 and Run. If it crashes, reLoad from tape and Run 400 to check the code. When all is well, delete lines 20 onwards and add line 2:

2 SAVE "YC SURVIVOR"

The game contains a number of variables initialy set to nominal values but which may be Poked to effect changes as shown in table 1.

Listing 1.

```
  20 CLS
  30 PRINT AT 21,0;"INPUT START ADDRESS"
  40 INPUT A
  50 CLS
  60 PRINT A;"-";
  70 INPUT A$
  80 IF A$="S" THEN RUN 30
  90 IF A$="SAVE" THEN GOTO 260
 100 IF LEN A$<>16 THEN GOTO 220
 110 PRINT A$;"=";
 120 LET TT=0
 130 FOR F=1 TO 15 STEP 2
 140 LET B$=A$(F TO F+1)
 150 LET P=16*CODE B$+CODE B$(2)-476
 160 POKE A,P
 170 LET TT=TT+P
 180 LET A=A+1
 190 NEXT F
 200 PRINT TT
 210 GOTO 60
 220 PRINT
 230 PRINT "INCORRECT LENGTH PLEASE RE-ENTER"
 240 PAUSE 4E4
 250 GOTO 60
 260 PRINT AT 21,0;"     PRESS ANY KEY TO SAVE     "
 270 PAUSE 4E4
 280 SAVE "YC SURVIVOR"
 290 RUN 20
 400 CLS
 410 PRINT AT 21,0;"INPUT START ADDRESS"
 420 INPUT A
 430 CLS
 440 LPRINT A;"-";
 450 LET TT=0
 460 FOR F=1 TO 8
 470 LET P=PEEK A
 480 LET B=INT (P/16)
 490 LET C=P-B*16
 500 LPRINT CHR$ (B+28);CHR$ (C+28);
 510 LET A=A+1
 520 LET TT=TT+P
 530 NEXT F
 540 LPRINT " =";TT
 550 GOTO 440
```

Table 1.

Address	Nominal value	Parameters	Function/notes
16674	204	see note	Wait key. Change to 202 for Break key
18863	61	see note	Change to 0 for infinite lives
17021	3	2 to 5	Speed. Increase to slow play
17287	0	0 to 9	Level.
19050	50	0 to 250	Grey block penalty points

Listing 2.

```
   3 CLS
   4 POKE 17287,0
   5 RAND USR 17735
   6 PRINT AT 10,8;"
   7 PRINT AT 11,8;" ANOTHER GAME?
   8 PRINT AT 12,8;"
   9 INPUT A$
  10 IF A$="Y" THEN GOTO 3
  11 STOP
```

(listing continued from previous page).

```
[illegible]
19450- 012E2E0101E001E3 =547
19458- 01000012E2E010138 =373

19466- 0235023502000901 =125
19474- 013902 3C02350200 =177
19482- 090101 4C024F024C =247
19490- 0200090101700092 =271
19498- 0000100200170020 =86
19506- 0200170025020017 =88
19514- 0025020017000000 =65
19522- 0400000000000000 =4
19530- 003C000000000000 =60
19538- 000000400000 2E401 =151
19546- 0004000000000010 =28
19554- 0010000100000 3C10 =105
19562- 0000000100000100 10 =33
19570- 0001000140000100 54 =106
19578- 00010005400001005E =180
19586- 0A0BB500210E1001 =280
19594- E10B5F0 [illegible] 00F801 =532
19602- 0003830303 [illegible] 38300 =402
[illegible]
20386- FF3FF80101137401 =707

20394- 01014E02FA018B00 =392
20402- 0000000000000000 =32
[illegible]
20522- 0000000000000000 =0
[illegible]
21290- 00800000001AC00000 =301
21298- 9702800000097000 8E =455
21306- 00000970 [illegible] 90000097 =426
21314- 039000000970 10000 0 =311
```

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```
10 MEMORY HIMEM-10
20 start=HIMEM+1
30 |ASSEMBLE,start
40 'get start
50 'limit &FFFF
60 'ORG start
70 'CP 10:SCF:RET Z
80 'RST 1,&87F2
90 'ORG &BD2B
100'JP start
110'END
```

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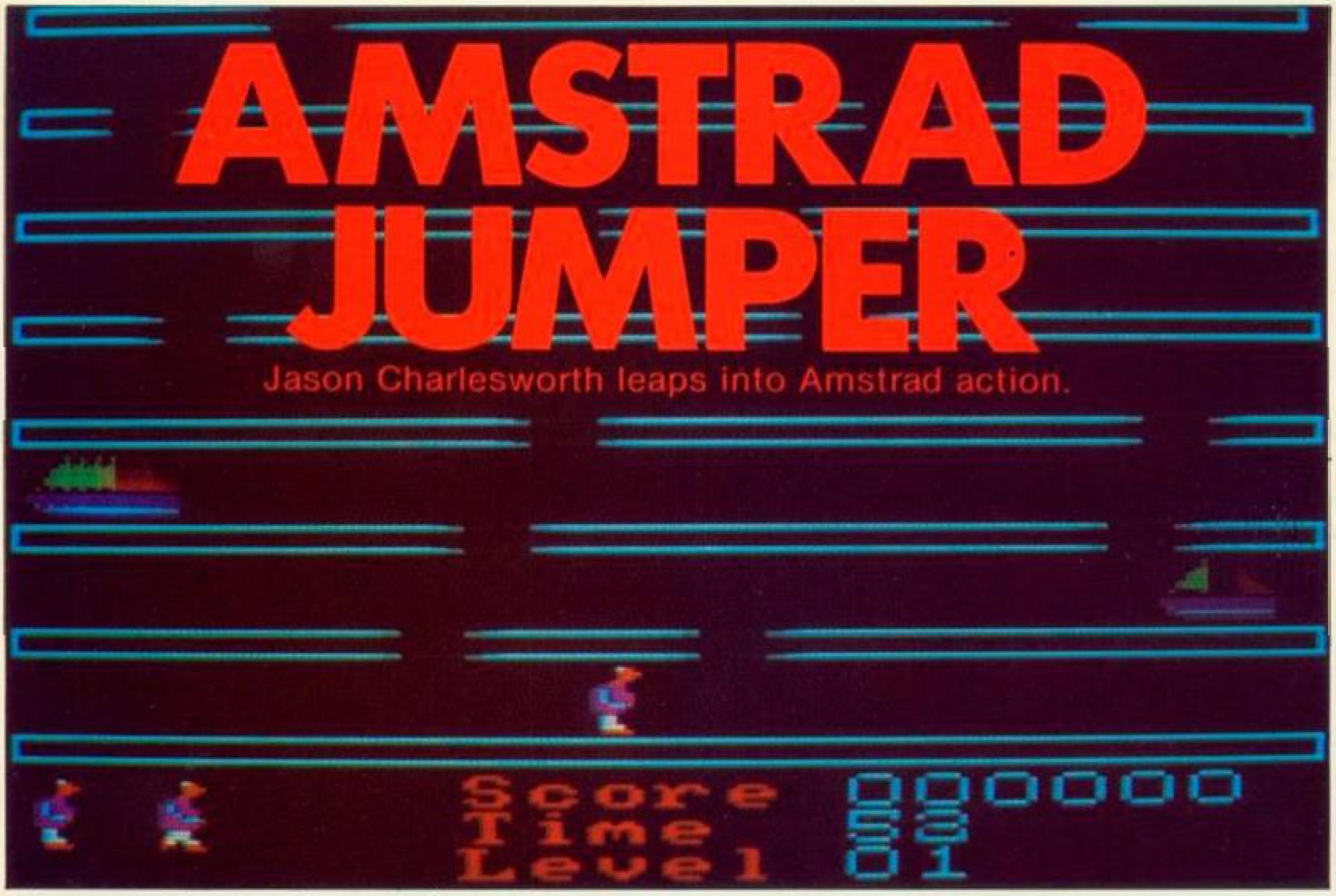
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AMSTRAD JUMPER

Jason Charlesworth leaps into Amstrad action.



JUMPER IS an arcade-quality game for the Amstrad CPC-464 computer in which you must guide a little man called Jumper to the top of the screen.

To get to the top of the screen, Jumper must jump through the moving holes in the platforms but if he falls through a hole he will be stunned and so will be unable to move for a while. However, all the time the nasties are advancing and Jumper, being a nice sort of chap, does not want to kill them so he must run away from them. To help him do this, the screen is wrap round i.e. if he runs off the left-hand side of the screen he will appear on the right-hand side and vice versa.

The scoring in the game is based on how many times you jump up. The more times you jump up, the more points you get and the amount of points you get per jump increases every other round. If your score is high enough at the end of the game, the program will ask for your name.

The game has 15 screens featuring different combinations of the nasties — yachts, teapots, telephones and tanks — and on each screen continuous music plays — translated by Robert Rhodes.

The game also features a joystick option and a hard or easy game option. To set up the game type in listing 1 and save it with

SAVE "JUMPER"

Next type in listing 2 and run it. If it finds an error in the code, correct it then rerun the program and when it gives the "Finished, no errors" message, save the code with

SAVE "CODE",b,35900,3700

The game may now be played by rewinding the cassette and typing Run"".

Listing 2 is on the next page.

Listing 1.

```
100 e=0:j=1:DEF FN x(n)=10*INT(PEEK(n)/16)+PEEK(n)-16*
INT(PEEK(n)/16)
110 INK 1,24:INK 14,26,0:INK 15,0,26:INK 5,0:INK 8,15:
INK 9,3:INK 13,4:INK 10,3
120 GOSUB 130:GOTO 360
130 REM SETUP
140 MEMORY 32767:BORDER 0:INK 0,0:MODE 0:PRINT"Please
wait":LOAD "!":e=0:j=1
150 ENV 1,5,2,1,5,1,1,1,0,8,5,-1,1,5,-2,3
160 DIM a$(5),a(5):FOR a=1 TO 5:READ a$(a),a(a):NEXT a
170 DATA Super Ted,50,Shaggy the Yak,40,Black Adder,30
,Doomdark,20,Mangled Cassette,10
180 RETURN
190 REM demo
200 BORDER 1:INK 0,1:MODE 0:CALL 35900
210 FOR a=0 TO 999:z$=INKEY$:NEXT a:BORDER 0:INK 1,0:R
ETURN
220 REM game
230 BORDER 1:INK 0,1:CALL 35946
240 FOR a=0 TO 1999:z$=INKEY$:NEXT a:BORDER 0:INK 0,0
250 sc=10000*FN x(37856)+100*FN x(37855)+FN x(37854)
260 FOR a=1 TO 5:IF sc<a(a) THEN NEXT a:GOTO 290
270 IF a<>5 THEN FOR b=5 TO a+1 STEP -1:a$(b)=a$(b-1):
a(b)=a(b-1):NEXT b
280 CLS:PEN 1:INK 1,24:INPUT "Name ",a$(a):a(a)=sc
290 RETURN
300 REM High score table
310 BORDER 0:INK 0,0:MODE 0
320 PEN 2:PRINT"  High Score Table":FOR a=1 TO 5:PEN a
+5
330 LOCATE 1,2*a+3:PRINT a$(a):LOCATE 16,2*a+3:PRINT a
(a):NEXT a
340 LOCATE 3,24:PEN 2:PRINT"Press a key"
350 IF INKEY$="" THEN 350 ELSE RETURN
360 REM instructions
370 BORDER 0:INK 0,0:MODE 0:PRINT"   Instructions"
380 RESTORE 360:FOR a=5 TO 11:READ z$:LOCATE 1,2*a-3:P
EN a+1:PRINT z$:NEXT a
390 LOCATE 1,24:PEN 1:PRINT"   Press a key"
400 IF INKEY$="" THEN 400
410 DATA Z     Left,\     Right,SHIFT Jump,0     Abort
,H     Halt,S     Start,SPACE Music on/off
420 DATA 1    Game,2    Demo,3    Easy game,4    Hard
game,5    Joystick,6    Keys
430 MODE 0:PRINT"      OPTIONS"
440 FOR a=2 TO 7:READ z$:LOCATE 4,2*a+2:PEN a+4;PRINT
z$:NEXT a
450 IF j=1 THEN LOCATE 4,14:PEN 14:PRINT"5":PEN 1:PRIN
T:PRINT"   6" ELSE LOCATE 4,14:PRINT"5":PRINT:PEN 14:P
RINT"   6":PEN 1
460 IF e=1 THEN LOCATE 4,10:PEN 14:PRINT"3":PEN 1:PRIN
T:PRINT"   4" ELSE LOCATE 4,10:PRINT"3":PRINT:PEN 14:P
RINT"   4":PEN 1
470 z$=INKEY$:IF z$="5" THEN j=1 ELSE IF z$="6" THEN j
=0
480 IF z$="3" THEN e=1 ELSE IF z$="4" THEN e=0
490 IF z$<>"1" AND z$<>"2" THEN 450
500 PEN 1:IF z$="2" THEN GOSUB 190:GOSUB 300:PEN 1:INK
 1,24:GOTO 360
510 IF Z$<>"1" THEN 490
520 POKE 37853,e:IF j=1 THEN POKE 37562,74:POKE 37570,
75:POKE 36659,72 ELSE POKE 37562,71:POKE 37570,22:POKE
 36659,21
530 GOSUB 220:PEN 1:GOSUB 300:PEN 1
540 GOTO 360
```

Listing 2.

```
10 MEMORY 22767:MODE 2:PRINT"Poking in progress,please
 wait"
20 DIM t(46):FOR a=0 TO 46:READ t(a):NEXT a
30 s=39900:FOR a=0 TO 46:READ a$:IF LEN(a$)<>160 THEN
70
40 t=0:FOR b=0 TO 79:z=VAL ("&"+MID$(a$,b*2+1,2)):t=t+
z:POKE s,z
50 s=s+1:NEXT b:IF t<>t(a) THEN 70
60 NEXT a:PRINT"Finished,no errors":END
70 PRINT"Error in line 90 or line ";(a*10+90):END
80 DATA [illegible]
90 DATA [illegible]
...
550 DATA [illegible]
```

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25-way	.40	.65
26-way	.45	.70
34-way	.60	.80
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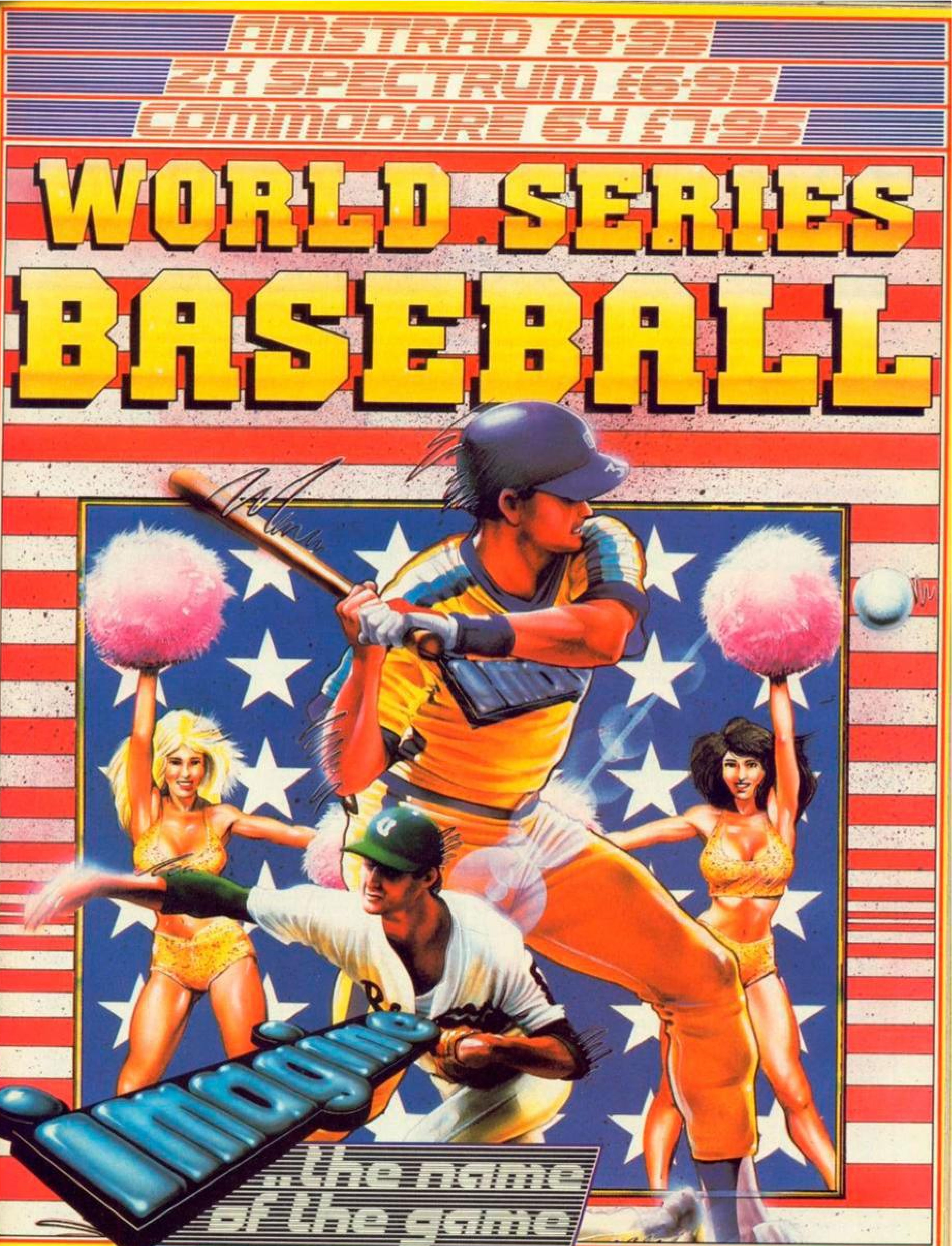
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CBM-64

The Telsoft service now extends to include the CBM-64.

THIS MONTH we are pleased to be able to announce the extension of the Telsoft service to Commodore 64 owners. It will be available initially to users who have the OEL Comms pack coupled with the Telemod 2 or similar modem.

Both the downloading program — which is listed with this article — and the full user-to-user communications program for the C-64 have slightly different menus to those produced for the BBC and Spectrum computers — see page 88.

The main difference is the addition of a machine-code Save routine which was considered essential since this is absent from the Commodore operating system. The full C-64 menu is: (1) Receive; (2) Transmit; (3) Chat; (4) Set Baud Rate; (5) Return to Basic; (6) Save Bytes — ie machine code sections. Brief details of the functions of these menu options are as follows:

Chat mode: This mode allows a real time conversation between the users with automatic changeover from one end to the other. Each time characters are entered from a different end a carriage return is generated automatically which ensures that the text sent by the two ends is not mixed up on the same line.

Transmit and Receive modes: These modes are used to transfer data between computers and if both users start off in the Chat mode the procedure is semi automatic, as follows:

The user who is going to send the program presses his Stop key which reverts the computers at both ends to the menu. Menu option 2 is called to go to Transmit mode and the user will then be asked to enter details of the data that is to be transmitted to the distant end.

Both the transmitting and receiving ends get a visual display of the progress of the data or program transfer. The data is sent in 256 character blocks, each block being numbered in hex and finishing with an OK if the receiving end calculates that it has received the block without any errors.

If the block contains errors, the OK is

Figure 1.

```
5 REM    HEX LOADER FOR CBM 64    FIG.1
6 REM
10 FOR I=680 TO 727:READA:POKEI,A:T=T+A
20 NEXT:IF T=6716 THEN GOTO 100
30 PRINT"ERROR IN DATA ";T-6716:END
40 DATA 169,1,133,186,169,1,133,184
50 DATA 133,185,169,8,133,183,169,208
60 DATA 133,187,169,2,133,188,169,56
70 DATA 133,251,169,199,133,252,169,251
80 DATA 162,231,160,206,32,216,255,96
90 DATA 68,79,87,78,76,79,65,68
100 SA=51000:LA=52855
110 INPUT"START ADDRESS";A
120 IF (A<SA) OR (A>LA) THEN GOTO 140
130 IF A/8=INT(A/8) THEN GOTO 150
140 PRINT:PRINT"ADDRESS ERROR":GOTO 110
150 T=(A-32768)AND255:PRINTA;:INPUTD$
160 IF D$="END" THEN GOTO 900
170 IF LEN(D$)=20 THEN GOTO 190
180 PRINT"WRONG LENGTH":GOTO 150
190 FOR B=0 TO 7:B$=MID$(D$,2*B+1,2)
200 GOSUB 300:IF E=1 THEN GOTO 280
210 POKE A+B,D:T=T+D:NEXT
220 B$=MID$(D$,18,3):GOSUB 300
230 IF E=1 THEN GOTO 280
240 IF T=D THEN GOTO 260
250 PRINT"CHECKSUM ERROR":GOTO 150
260 A = A+B:IF A<LA THEN GOTO 150
270 GOTO 800
280 PRINT TAB(8+2*B+D)C$"??"
290 B=8:NEXT:GOTO 150
300 E=0:D=0:FOR N=1 TO LEN(B$)
310 C$=MID$(B$,N,1):GOSUB 400
320 IF E=1 THEN D=N:N=4:NEXT:RETURN
330 D=D*16+X:NEXT:RETURN
400 X=ASC(C$)-48:IF X<0 THEN E=1:RETURN
410 IF X<10 THEN RETURN
420 X=X-7:IF X<10 THEN E=1:RETURN
430 IF X>15 THEN E=1
440 RETURN
500 H$="0123456789ABCDEF"
510 FOR A=SA TO LA STEP 8
520 PRINT A;"? ";:T=(A-32768)AND255
530 FOR B=0 TO 7:X=PEEK(A+B):GOSUB 600
540 T=T+X:NEXT:PRINT"=";
560 Y=INT(T/256):PRINT MID$(H$,Y+1,1);
570 X=255 AND T:GOSUB 600:PRINT
580 NEXT:GOTO 900
600 PRINT MID$(H$,INT(X/16)+1,1);
610 PRINT MID$(H$,1+(XAND15),1);:RETURN
800 SYS 680:C$=CHR$(34)
810 PRINT:PRINT" TO RELOAD CODE :"
815 PRINT:PRINT"  LOAD"C$"DOWNLOAD";
820 PRINTC$",1,1  (RETURN)"
825 PRINT:PRINT"  THEN TYPE   NEW";
830 PRINT"  (RETURN)"
835 PRINT:PRINT"TO RUN THE PROGRAM";
840 PRINT"  SYS 51000  (RETURN)"
900 PRINT:PRINT:PRINT"1  ENTER DATA"
910 PRINT:PRINT"2  PRINT DATA"
920 PRINT:PRINT"3  SAVE DATA"
930 INPUT Z:ON Z GOTO 100,500,800
```

Figure 2.

```
51000 ? A9068D21D08D20D0=3E2
51008 ? A90F8D8602A90E20=2E4
51016 ? D2FFA9008D15D0A9=4DD
51024 ? FF8D8A02BA8E92CE=510
51032 ? 20CAC920C7CB20F8=4D5
51040 ? CAAD80CEC931F023=532
51048 ? C935F014C936D006=43F
51056 ? 208EC74C5BC7A914=410
51064 ? 20D2FF202FCBD0DB=52E
51072 ? 203FC8A92020D2FF=461
51080 ? 4C93C94C4AC82063=411
51088 ? CC2022CDA95B85FD=4F1
51096 ? A9CE85FE2028CDA0=547
51104 ? 002095CC202FCBC9=404
51112 ? 44F00BC954D0ED20=4E1
51120 ? D2FFA901D007A944=4EF
51128 ? 20D2FFA90885BA20=4B9
51136 ? 25CDA90820ABCCA9=4A3
51144 ? BD85FDA9CD85FEA0=6A0
51152 ? 002095CC2025CD20=383
51160 ? 95CC9840A00040C83=4CC
51168 ? CE20D8C969A82025=4C4
51176 ? CD2095CC9840A906=4C5
51184 ? 8D83CE20D8C9ADA7=5E3
51192 ? CE85FBADA8CE85FC=6EA
51200 ? 68A82060CBA90185=38A
51208 ? B885B998A293A0CE=539
51216 ? 20BDFFAEA9CEACAA=567
51224 ? CEE8D001C82025CD=479
51232 ? A9FB20D8FF20F1CB=597
51240 ? 6020D9CCC90DD00B=3FE
51248 ? A90085C7A92020D2=3E0
51256 ? FFA90D20D2FF60A9=4E7
51264 ? 0D2029C8A90D20D2=306
51272 ? FF602063CCA000A9=43F
51280 ? FF9993CEC8D0FA20=5FB
51288 ? D2CB90FB20D2CBB0=5ED
51296 ? FB8D72CEA0008C7C=4D0
51304 ? CE8C7DCE202ECCAD=4D4
51312 ? 72CE29F0C980D0E4=5C6
51320 ? 20D2CBB0DA9973CE=599
51328 ? C8202ECCC009D0F0=4EB
51336 ? A000AD76CE2980D0=492
51344 ? 0FA52B85FB18A52C=3D8
51352 ? 6D75CE85FC4CAAC8=587
51360 ? AD78CE85FBAD79CE=607
51368 ? 85FC20D2CBB0A820=55E
51376 ? D9CC20D2FFC820D9=607
51384 ? CC202ECCC010D0EA=528
51392 ? A92020D2FFAD75CE=56A
51400 ? 202ECD20D2CBB087=4D7
51408 ? CD7CCEF00BA95820=503
51416 ? D2FF2030C84C57C8=52C
51424 ? 20D2CBB0F8CD7DCE=65D
51432 ? D0EBAD75CEA8B993=687
51440 ? CED00E2030C8A991=4EE
51448 ? 20D2FF4C7EC94C57=51F
51456 ? C8A0008C7CCE8C7D=447
51464 ? CE20D2CBB0F091FB=5BF
51472 ? 202ECCC8CC77CED0=4D3
51480 ? F020D2CBB0E0CD7C=59E
51488 ? CEF008A95820D2FF=4D8
51496 ? 4C57C820D2CBB0CE=4CE
51504 ? CD7DCEF0034C23C9=473
51512 ? 20ACCB2030C8AD75=409
51520 ? CEA8A9009993CEAD=506
51528 ? 84CEC902D02520BC=436
51536 ? CBA9C820F3CBA955=568
51544 ? 2016CDA95820F3CB=432
51552 ? 20C7CBAC73CEC808=54F
51560 ? B993CED02398D0F7=5D4
51568 ? 4C5BC7A9552016CD=3DF
51576 ? 20F1CB4C63C9AC77=4EF
51584 ? CE20D2CB880D0FA20=57D
51592 ? D2CB20D2CB4C47C9=53E
51600 ? 4C5CC8A52B85FBA5=4F5
```

TELSOFT

omitted and the block is retransmitted by the sending end until it is received without error.

When data transfer is successfully completed Program loaded OK is printed at both ends and they then revert back to Chat mode.

Set baud rate: This gives the user the option to change baud rates to try out different methods of working; e.g., the Telemod 3 has the facilities for full duplex working at 1200/75 and 75/1200. However, the program was specifically written for 1200/1200 bit/s half duplex working — selection 4 from the baud rate menu.

Save bytes: As mentioned earlier this facility is built in to enable users to save any number of machine code sections to tape or disc after downloading. The start and finish memory addresses of the machine code can be entered using either decimal or hex numbering. Naturally, any Basic program located in its usual position in memory — i.e., 2048 upwards — should be saved using the machine's built-in Save to tape or disc facility.

Only the Download section of the machine code is given in this listing, not the Transmit and Chat routines.

When you have been returned to the menu, exit to Basic and list the first few lines of the program where we will give the instructions needed to Save the program to tape or disc.

The download program is approximately 1800 bytes in length and consists of a Basic hex loader program and a list of machine code. Type in the hex loader program listed in figure 1 and then Save to tape or disc before you Run it. When the hex loader program is run the computer will give the prompt "Start address (hex)?" and you should enter 51000 and press Return.

The computer will print the start address of the line and a question mark — e.g., 51000? — you then have to enter all the characters after the question mark from the relevant line in figure 2 and press Return at the end of the line. If all is well you will be prompted with the next address and so on. Each line comes with its own checksum so that you can correct any errors as you go.

If you want to enter the machine code in several sessions you can save part of the code — but to tape only — by entering End instead of the next line of data when you are prompted with a line number and question mark. When you want to continue typing in the machine code program it is reloaded with the Command.

When you have entered all the machine-code lines the hex loader program will automatically save this machine-code section with the title Download, so make sure that you have your tape recorder or disc ready to record, before starting to type in the machine-code section.

If you want to enter the machine code in several sessions you can save part of the code (but to tape only) by entering End instead of the next line of data when you are prompted with a line number and question mark. When you want to continue typing in the machine code program it is reloaded with the command.

LOAD "DOWNLOAD",1,1

then enter New and Load and Run the hex loader program.

When you have completed and saved the Download program it is reloaded with the command

LOAD "DOWNLOAD",1,1

or 8,1 for disc — followed by the New command. To Run the program, enter

SYS 51000 (Return)

Modem transmit speeds

Provided the machine code is correct you will be asked to select the modem transmit and receive speeds. For the OEL Telemod 2 modem simply select Option 4.

To receive software from Telsoft, the *Your Computer* downloading service, first dial up Colchester (0206) 8068 and check when software for your machine is being downloaded. This audio recorded information service will also advise you which telephone numbers to ring for the 300 and 1200 bit/s downloading services.

When a program you want to download is available, make sure your modem is correctly set up and dial up the telephone number appropriate to your modem's speed. When you hear the modem tones switch the modem to line and replace the receiver.

Select Option 1 from the menu — Receive. As each block of data is recieved the block number and the program title will be displayed, followed by "OK" if there were no errors. Note that the "OK" will be missing from any blocks in which errors are detected and that the downloading program will wait for these blocks to come round again in order to make a second attempt to load.

When all blocks have been loaded, the Program loaded OK message will appear and you will be returned to the menu or Chat mode after which select Option 5 to leave the Telsoft Menu and list the first few lines of the Basic program you have received to get the necessary Saving instructions. ■

```
51608 ? 2C05FCA0000B1FB99=52A
51616 ? 2200C0B1FB0523F0=4CE
51624 ? 0BA52205FBA52305=447
51632 ? FC4C9BC918A5FB69=57D
51640 ? 02052D052F0531A5=37B
51648 ? FC6900052E853005=412
51656 ? 32602063CCA9028D=3E1
51664 ? 84CEA90B0D02DE60=4A3
51672 ? 8E81CE8C82CEA200=533
51680 ? A9098DCDCE202FCB=4D4
51688 ? C914F016C90DF051=4E2
51696 ? C924D01920D2FF0D=544
51704 ? C3CEE84CE5C9E000=64B
51712 ? D0E3E000F0DF20D2=554
51720 ? FFCA4CE5C9C93090=554
51728 ? D4C93A901548ADC3=444
51736 ? CEC924F004684CE5=460
51744 ? C960C94190BFC947=4BA
51752 ? B0BB20D2FF38E930=4D5
51760 ? C90A9002E907E005=36A
51768 ? F0AB9DC3CEE84CE5=61A
51776 ? C9E000F0A0E001D0=52A
51784 ? 07ADC3CEC924F095=4FF
51792 ? A92020D2FFA9FF9D=54F
51800 ? C3CEA2008ECFCE8E=544
51808 ? D0CE8ED1CE8ED2CE=659
51816 ? ADC3CEC924D006A9=512
51824 ? 0F8DCDCEE8BDC3CE=5DD
51832 ? C9FFF01D20CBCAB0=5B2
51840 ? 3418BDC3CE6DCFCE=524
51848 ? 8DCFCEA9006DD0CE=566
51856 ? 8DD0CEB020E84C75=534
51864 ? CAADCFCEAC83CE99=642
51872 ? A3CEC8ADD0CE99A3=660
51880 ? CEC8100C83CEAC82=561
51888 ? CEAE81CE602025CD=4ED
51896 ? A200BD41CEC921F0=500
51904 ? 0720D2FFE84CBACA=570
51912 ? 4CDEC3ADCDCE8DCE=65E
51920 ? CEADCFCE8DD1CEAD=6C1
51928 ? D0CE8DD2CE18ADD1=639
51936 ? CE6DCFCE8DCFCEAD=68F
51944 ? D2CE6DD0CE8DD0CE=6BE
51952 ? B005CECECED0E660=625
51960 ? 2063CCA90F8D8602=414
51968 ? A95185FDA9CD85FE=575
51976 ? A000209DCC2025CD=343
51984 ? 209DCC209DCC209D=3DF
51992 ? CC2022CD20A9CC20=3A6
52000 ? 95CC2022CD2095CC=411
52008 ? 202FCB20D2FF608E=421
52016 ? 81CE8C82CE2069CC=4B0
52024 ? 20ECCC20CACCC900=40F
52032 ? D00D20FDCCC931F0=4F0
52040 ? 062001CC4C35CB8D=314
52048 ? 80CEAE81CEAC82CE=597
52056 ? 60AE92CE9A4C5BC7=4CE
52064 ? 2022CDA92285FDA9=465
52072 ? CE85FEA0002095CC=4DA
52080 ? 2025CDA00FA92099=393
52088 ? 93CE88D0FA8D93CE=619
52096 ? 202FCBC914D010C0=417
52104 ? 00F0F520D2FF88A9=58F
52112 ? 209993CE4C80CBC9=50A
52120 ? 0DF00B20D2FF9993=4BD
52128 ? CEC8C010D0DAA920=579
52136 ? 20D2FF60A92020D2=4B4
52144 ? FFA94F20D2FFA94B=58C
52152 ? 20D2FF60A9138D00=452
52160 ? DEA9128D00DE60A9=4CD
52168 ? 538D00DEA9528D00=40E
52176 ? DE60A996180D07CE=547
52184 ? 8C82CEAC82CE2004=4D4
52192 ? CC20ECCCCE87CED0=677
52200 ? 02386020FDCCB0EE=509
52208 ? 60A9FA8C82CEA820=597
52216 ? 04CC88D0FAAC82CE=616
52224 ? 602004CC8AA2A8CA=3EE
52232 ? D0FDAA2069CC6020=454
52240 ? 25CDA90220ABCC20=364
52248 ? 95CCAD8ECE20D2FF=573
52256 ? A92020D2FFA90320=3A6
52264 ? ABCC20D8C9604D7D=48A
52272 ? CE8D7DCEA200AD7D=4AA
52280 ? CE2A9010AD7DCE49=411
52288 ? 008D7DCEAD7CCE49=460
52296 ? 100D7CCE2E7CCE2E=3D5
52304 ? 7DCECAD0E160A000=516
52312 ? A9009900D4C8C018=40E
52320 ? D0F660A99320D2FF=5B3
52328 ? 6048A5A2290FD01F=37E
52336 ? A5D448A5A22910F0=4A1
52344 ? 05A9A44C80CCA920=42B
52352 ? 20D2FFA90085D4A9=51C
52360 ? 9D20D2FF6885D468=53F
52368 ? 6020D2FFC801FDC9=620
52376 ? 21D0F6C8602025CD=4B9
52384 ? A90C20ABCC2095CC=46D
52392 ? 60A9058E81CEAAA9=4E6
52400 ? 2020D2FFCAD0FAAE=603
52408 ? 81CE60C914F008C9=505
52416 ? 7FF00160A91460A9=456
52424 ? 7F6020E4FFC9C190=5C4
52432 ? 07C9DBB00338E960=4AF
52440 ? 60C941900EC95B90=494
52448 ? 08C961900EC97BB0=49C
52456 ? 02492060480A4808=2D5
52464 ? 20E1FFD0034C59CB=533
52472 ? 2060AA6860AD00DE=485
52480 ? 49016A9003A90060=250
52488 ? AD01DE6048AD00DE=307
52496 ? 49026A6A6860200C=223
52504 ? CDB0FB0D01DE20EC=508
52512 ? CC602025CD2020CD=373
52520 ? A90D20D2FF604829=3A0
52528 ? F06A6A6A6A0930C9=3CA
52536 ? 3A30031869072 0D2=21F
52544 ? FF68290F0930C93A=31B
52552 ? 300318690720D2FF=2F4
52560 ? 60444F574E4C4F41=2C4
52568 ? 44204D454E552131=243
52576 ? 2020205245434549=228
52584 ? 5645213520202045=1FE
52592 ? 5849542054 4F2042=28A
52600 ? 4153494321362020=22F
52608 ? 2053415645204259=28A
52616 ? 5445532128205553=285
52624 ? 4520122053544F50=26D
52632 ? 2092205 44F205245=2C4
52640 ? 5455524E20544F20=2CC
52648 ? 4D454E5520292145=28C
52656 ? 4E544552204E554D=2F9
52664 ? 4245522021494620=281
52672 ? 4144445245535320=2E6
52680 ? 495320494E204845=2C8
52688 ? 582C119D9D9D9D9D=476
52696 ? 9D9D9D9D9D9D9D9D=5C0
52704 ? 9D9D9D9D50524546=481
52712 ? 4958205749544820=305
52720 ? 2421535441525420=2E3
52728 ? 4144445245535320=31E
52736 ? 464F522041524541=220
52744 ? 202146494E414C20=1D3
52752 ? 4144445245535320=236
52760 ? 464F522041524541=238
52768 ? 202150524F475241=22C
52776 ? 4D2054495544C4520=237
52784 ? 284D415820313620=1E5
52792 ? 4348415227532920=219
52800 ? 21124E4F54205641=21B
52808 ? 4C4944922C205452=2A5
52816 ? 5920414741494E20=249
52824 ? 3A20214449534320=216
52832 ? 4F52205441504520=26B
52840 ? 2820442F54202920=1E0
52848 ? 3F21000000000000=0D0
```

TELSOFT



A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via *Your Computer's* Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. On the BBC you call the service by entering

CALL &6A00

while Spectrum owners must type

RANDOMIZE USR 60000

So far OE Ltd's Telemod 2 and VTX 5000 modems have been tested with the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors, otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&69FF
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6F87 THEN 280
60 IF A<&6A00 OR A>&6FE7 THEN 20
70 PRINT ~A" ";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$= MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 260
140 X$= MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 260
160 B= EVAL("&"+MID$(B$,2*N+1,2))
170 ?A=B:A=A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN (C$)
200 X$=MID$(C$,M,1):GOSUB 300
210 IF E =1 THEN A=A-1: GOTO 260
220 NEXT
230 IF T= EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR !"
270 A=8*(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6F87
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 :A9C0A0FEA20120F4,4C6
6A08 :FF20616C20486DC9,38A
6A10 :31F000C934F0E9C9,4C8
6A18 :35F0064C0C6A4C47,200
6A20 :6AA90C20E3FFA9E0,4B2
6A28 :A000A2FF20F4FFA9,4FD
6A30 :03A20020F4FFA902,363
6A38 :A20220F4FFA9C0A0,4C8
6A40 :FEA20020F4FF60A9,4BC
6A48 :0C20E3FF20F76BA9,439
6A50 :15A20120F4FFA800,3E8
6A58 :A9FF8899056FD0FA,507
6A60 :A915A20120F4FF20,394
6A68 :0C6C90F8200C6C00,348
6A70 :FBA0000477847804,416
6A78 :79847A0847805702,380
6A80 :D56DA57029F0C900,489
6A88 :D0E2200C6C00D099,46B
6A90 :7100C020D56DC009,364
6A98 :D0F0A000A5742900,422
6AA0 :D000A51C057610A5,354
6AA8 :1D65730577200C6C,209
6AB0 :B00520E3FFC02005,524
6AB8 :6DC01000F0A57320,435
6AC0 :B26D200C6C00A0C5,3CC
6AC8 :7AF000A95020E3FF,478
6AD0 :20E7FF4C676A200C,34F
6AD8 :6C000CC57DF000A9,40C
6AE0 :5020E3FF20E7FF4C,4AC
6AE8 :676AA573A0B9056F,43E
6AF0 :D00E20E7FFA9B020,380
6AF8 :E3FF4C036B4C676A,469
6B00 :A000847A847B200C,2C9
6B08 :6CB0F2917620D56D,477
6B10 :CBC4750DF1200C6C,45A
6B18 :B0E3C57AF000A950,4CE
6B20 :20E3FF20E7FF4C67,488
6B28 :6A200C6C0BCFC57B,3C1
6B30 :F000A95020E3FF4C,447
6B38 :676A20C76B20E7FF,429
6B40 :A573A0A90099056F,3F6
6B48 :A50AC902D05020D7,419
6B50 :6BA9C020056CA955,3B0
6B58 :20306EA95020556C,290
6B60 :A915A20120F4FF20,394
6B68 :F76BA471C0000905,505
6B70 :6FD05190D0F7A90C,4A4
6B78 :20E3FF20A56DA95A,437
6B80 :0582A9AF8503A907,3D7
6B88 :20006E20F86D20A8,2D0
6B90 :6DA90520006EA900,2DA
6B98 :20E3FF20F86DA9D2,502
6BA0 :20E0FF4C0C6AA955,3BF
6BA8 :20306EA99620556C,2DE
6BB0 :4C6A6BA475200C6C,2D2
6BB8 :08D0FA200C6C200C,316
6BC0 :6C4C4B6B4C6C6A99,336
6BC8 :2020E3FFA96F20E3,43D
6BD0 :FFA96B20E3FF60A9,51E
6BD8 :9CA000A6BAE00200,41E
6BE0 :0BA21320F4FFA212,387
6BE8 :20F4FF60A29720F4,4C0
6BF0 :FFA29620F4FF60A9,553
6BF8 :9CA000A6BAE00200,41E
6C00 :EBA25320F4FFA252,4E7
6C08 :20F4FF6018A99605,44F
6C10 :0F847EA991A20020,38D
6C18 :F4FF8009C007D005,448
6C20 :6B604C0C6AA47E20,2D4
6C28 :496CC60FD0023B60,374
6C30 :A5BAC902D0062079,369
6C38 :6E00EC60A991A201,447
6C40 :20F4FF98A47E000F,55C
6C48 :60AAA2D2CAE0CAD0,5AA
6C50 :FBAA60A900047EA0,458
6C58 :20496CB0D0FAA47E,449
6C60 :60A9E0A000A2FF20,452
6C68 :F4FFA9000050A90C,460
6C70 :20E3FF20A86DA904,3E4
6C78 :20006EA90905B2A9,2F0
6C80 :6F8503A00020F86D,39C
6C88 :20156DC941F000C9,370
6C90 :42F011C943F0174C,3A2
6C98 :616CA900A20120F4,335
6CA0 :FF4C076CA900A203,3C4
6CA8 :20F4FF4C076CA900,433
6CB0 :A20420F4FFE60AA5,4CE
6CB8 :7C20E3FFA47E20AD,46B
6CC0 :6DA90820006E20F8,2C4
6CC8 :6DA01720156DC941,2D0
6CD0 :F000C942F011C943,413
6CD8 :F0174C616CA907A2,372
6CE0 :0120F4FF4C096DA9,37F
6CE8 :07A20320F4FF4C09,314
6CF0 :6DA907A20420F4FF,3D6
6CF8 :E60AA50AC902D009,443
6D00 :A9E0A000A20120F4,3E8
6D08 :FFA57C20E3FF2053,495
6D10 :6C20536C6020A86D,2E3
6D18 :A90520006E20F86D,2C1
6D20 :20A86DA90520006E,274
6D28 :20F86D20A86DA905,36B
6D30 :20006E20F86D20A8,2DE
6D38 :6D847EA90320006E,2A9
6D40 :A9D220E0FF857C60,4D0
6D48 :A90C20E3FF20AB6D,3EF
6D50 :A90720006EA99A05,306
6D58 :82A96E8583A00020,361
6D60 :F86D20A86D20996D,3C0
6D68 :20996D20996D20A8,317
6D70 :6DA90A20006E20F8,2C6
6D78 :6D20A86DA9022000,270
6D80 :6E20FB6D20A86D20,34B
6D88 :E7FFA9D220E0FF40,5A0
6D90 :A90FA20020F4FF60,3D5
6D98 :60A90020006E20F8,287
6DA0 :6D20A86D6D20A86D,33A
6DA8 :20A86D20E7FF20E7,445
6DB0 :FF604829F06A6A6A,45A
6DB8 :6A0930C93A300318,1F1
6DC0 :690720E554F6290F,312
6DC8 :0930C93A30031869,1F0
6DD0 :0720E3FF60457005,3AE
6DD8 :7BA200A57B2A900C,300
6DE0 :A57B4900057BA57A,390
6DE8 :4910857A267A267B,299
6DF0 :CAD0E86820E3FFC8,5AC
6DF8 :B182C900D0F6C860,4F7
6E00 :B67DAAA92020E3FF,478
6E08 :CAD0FAA67D60C97F,55F
6E10 :D000A90620F4FFE0,4FD
6E18 :00F012A97FC92000,3C3
6E20 :0EC90AF00AC90DF0,3A1
6E28 :06C907F002A90060,2D1
6E30 :057CB67D047EA991,440
6E38 :A20120F4FFA903A2,404
6E40 :0720F4FFA996A200,403
6E48 :20F4FF902902F0F4,4BA
6E50 :A47CA997A20920F4,41F
6E58 :FFA903A20420F4FF,464
6E60 :A991A20020F4FF60,49F
6E68 :09C007D0056B604C,2C1
6E70 :0CA4A57CA67DA47E,3DC
6E78 :60047E867DA99A62,446
6E80 :0020F4FF902901F0,3CD
6E88 :0BA996A20920F4FF,408
6E90 :9810900130A67DA4,348
6E98 :7E60444F574E4C4F,281
6EA0 :4144494E47204D45,215
6EA8 :4E550D3120202052,193
6EB0 :4543454956450D34,1F2
6EB8 :2020205345542042,1AE
6EC0 :6175642052617465,2EA
6EC8 :0D35202020455849,1B0
6ED0 :5420544F20424153,2B0
6ED8 :49430D454E544552,217
6EE0 :204E554D42455220,1F6
6EE8 :2020555345204354,1EC
6EF0 :524C204720544F20,1F5
6EF8 :52455455524E2054,254
6F00 :4F204D454E552029,1ED
6F08 :0D53455420545241,200
6F10 :4E534D4954204261,24E
6F18 :756420526174650D,292
6F20 :4120202037352042,1AF
6F28 :6175640D42202033,1FC
6F30 :303020426175640D,209
6F38 :4320313230302042,1B8
6F40 :6175640D53455420,253
6F48 :5245434549564520,223
6F50 :4261756420526174,2C3
6F58 :650D50524F475241,230
6F60 :4D20204C4F414445,1F3
6F68 :4420204F4B0D5052,280
6F70 :45535320414E5920,213
6F78 :4B455920464F5220,218
6F80 :4D454E550D202020,1A2
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48k          fig 1
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23658,8: CLS : PRINT
30 INPUT "Start Address ";a
50 IF a>61135 THEN GO TO 280
60 IF a<60000 THEN GO TO 20
70 PRINT a;
80 INPUT " :";b$
85 IF b$="END" THEN GO TO 280
90 IF LEN b$<>20 THEN GO TO 260
100 LET t=a-256*INT (a/256)
110 FOR n=0 TO 7
120 LET x$=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x$=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET y=y*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=t+y: NEXT n: LET y=0
190 FOR m=1 TO 3
200 LET x$=b$(17+m TO 17+m)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-1: GO TO 260
220 NEXT m
230 IF t=y THEN PRINT ":";b$: GO TO 50
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8*INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23658,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 :CD15EDC307ECCD15,4C7
60008 :EDCD36ECCD66EDCD,631
60016 :50EDCD47EE30FBCD,5AF
60024 :B8EDFE31CA99EAFE,69A
60032 :35CA07EAC366EACD,5D0
60040 :15ED3EFACD84EDCD,5FD
60048 :15EDC9CD15EDC366,553
60056 :EACD66ED11E5EE06,58C
60064 :003EFF121310FCCD,458
60072 :15EE11CDEE06173E,302
60080 :20121310FCCD1FED,30A
60088 :30F0CD50EDCD1FED,588
60096 :30F03265EF3E0032,3E9
60104 :6CEF326FEF3270EF,544
60112 :3A65EFCDEBEC3A65,5A1
60120 :EFEAF0FE0020DE0E,627
60128 :091165EFCD1FEDDA,581
60136 :AAEA1312CDEBEC0D,552
60144 :20F23A69EFEA6020,51A
60152 :0021485C3A60EF0E,3AC
60160 :004709226BEF0E00,1DA
60168 :11CDEECD1FED309A,47F
60176 :12130CCDEBEC79FE,45C
60184 :1020F83A60EFCD01,447
60192 :ECCD1FEDDAAAEA21,574
60200 :6FEF0E20133E5011,326
60208 :E0EE12133E0012CD,340
60216 :D7ECCDAAECC3AAEA,6B1
60224 :CD1FEDDAAAEA2170,518
60232 :EFBE20E121E5EE3A,524
60240 :60EF05AF3E000CA7,3CC
60248 :3E000E2000CDD7EC,40F
60256 :3E2132005CC3FFEB,482
60264 :3E00326FEF3270EF,3C7
60272 :ED5B6BEF0E00CD1F,40C
60280 :EDDAAAEA3273EFCD,634
60288 :EBEC3A6BEFFE0020,586
60296 :053A69EFEA003A73,432
60304 :EF12130C3A6AEF89,3FC
60312 :200CCD1FEDDAAAEA,508
60320 :216FEFBEC22DEBCD,584
60328 :1FEDDAAAEA2170EF,5A2
60336 :BEC22DEB3E6F32E2,509
60344 :EE3EA032E3EE3E00,490
60352 :32E4EE3A085CFE21,581
60360 :2003CD15EECDD7EC,553
60368 :CDA6EC21E5EE3A6B,5C5
60376 :EF05AF3E000CA736,422
60384 :0021E5EEED4B6AEF,561
60392 :0C7EFE00C20DEA23,4FC
60400 :0020F63EFACD84ED,589
60408 :3E01D3FEC3AAEACD,5EB
60416 :1FED30F0C30DEAF3,594
60424 :0603AFD3FF10FB3E,3D0
60432 :4003FF3EFFD3FF3E,5AF
60440 :31D3FF3E0F320F5C,385
60448 :320D5C32485C3E01,250
60456 :D3FE21915CCB9EFB,56A
60464 :CD50EDC366EACD15,52F
60472 :EECD66ED3E01D3FE,556
60480 :2165EE3E00CD0FEC,442
60488 :CD84ECCDA3ECCDA6,654
60496 :EC23CD77ECCD77EC,5BF
60504 :CDA6ECCD84ECCDA6,661
60512 :EC233E0DCD0FECCD,4CF
60520 :84EC23CDA3EC3E03,498
60528 :CD0FECCD84ECC9CD,6D8
60536 :A3EC3E07CD0FECCD,561
60544 :84EC23C97EFE00C8,520
60552 :CD8BED23C384ECFE,651
60560 :00C8F53E20CD8BED,520
60568 :F13DC30FECCDA6EC,65D
60576 :CDA3ECCDA6EC3E0D,5A6
60584 :CD8BED3EFF320C5C,574
60592 :C9F513E6F0CB1FCB,60C
60600 :1FCB1FCB1FF630FE,4CF
60608 :3AFACAECC6071213,498
60616 :F1E60FF630FE3AFA,686
60624 :D4ECC6071213C921,46C
60632 :CDEEE5CD84ECE106,69C
60640 :173E20772310FC3E,339
60648 :0077C9E52170EFAE,538
60656 :77C50E007EA7C817,449
60664 :300D7EEE00773A6F,3C9
60672 :EFEE10326FEF3721,305
60680 :6FEFCB1623CB160D,358
60688 :20E2C1E1C9110501,394
60696 :216A00CDB503C93E,32F
60704 :963277EFCD47EDDA,529
60712 :2EEDF1C366EACDAC,5C0
60720 :ED7BEA01F602D3FE,548
60728 :AF2177EF35200237,2FC
60736 :C9CD77ED38EBC9CD,5F0
60744 :47EED0FECBCB37C9,5E6
60752 :F5D0FF3A01EFFE00,5C7
60760 :20043E3610023E37,187
60768 :D3FFDB7FF1C9F53A,675
60776 :01EFFE0020043E36,376
60784 :D3FFCD50EDF1C93E,644
60792 :00DBFFE60037C0DB,59.
60800 :FFE60237C0DBFFE6,626
60808 :3E2004DB7FA7C93A,3E0
60816 :01EFFE0020043E37,397
60824 :10023E3AD3FFDB7F,452
60832 :C9CD47ED3A73EFDB,5DE
60840 :F1C366EAF53ED23D,5EE
60848 :20FDF1C9CDACED3D,62A
60856 :20FAC9C5D5E5F5FE,7BD
60864 :7F2013CDF9EDFEBC,537
60872 :200CFE0D20053E20,20A
60880 :D73E0DD718103E20,34F
60888 :D73E0DD73A085CFE,4E8
60896 :2120033E0DD73E5F,2E6
60904 :D73E0DD7F1E1D1C1,648
60912 :C9FE07201CFEC820,4F3
60920 :19FE0C2014FE0820,380
60928 :10FE0D200CFE20FA,367
60936 :0FEEFE00FA11EE3E,40A
60944 :00C93E07C9CD6000,32C
60952 :3E02CD01163E1032,1C4
60960 :095CC93E121601CD,302
60968 :1122C93E121600CD,257
60976 :1122C9C5D5E53E02,3E8
60984 :CD0116CD47EE30F8,451
60992 :CD5CEEE1D1C1C93A,5CD
61000 :385CCB6F200C3A08,2BF
61008 :5CF521385CCBAEF1,4C3
61016 :A7C937C9F5111000,3DE
61024 :CD1BEDF1C9444F57,406
61032 :4E4C4F4144494E47,2B4
61040 :204D454E550D3120,216
61048 :2020524543454956,276
61056 :450D352020204578,217
61064 :697420746F204261,32B
61072 :7369630D20205573,2DF
61080 :652053796D626F6C,393
61088 :2053686966742020,380
61096 :204720746F205265,2C9
61104 :7475726E20746F20,39C
61112 :4D454E5520202045,278
61120 :4E544552204E554D,389
61128 :4245522000000000,1C1
```


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TOOLKIT

THERE ARE a number of Basic Programmer's Toolkits on the market for the ZX Spectrum. They all seem to have one or two absolutely brilliant functions, which are only used because they are there. Meanwhile, the normal toolkit functions are pretty ordinary and often not at all user-friendly. I have tried to compile a number of Toolkit functions which operate the way I want them to. I also decided to write a user-friendly System to link them all up. A tidy Menu Page is included as is a method of returning to the menu any time Input is requested.

Single-key entry and default values have been avoided. It is too easy to make a mistake and ruin a program. Every parameter is prompted for on screen. Most errors that can occur are trapped. There are a number of error messages.

A feature that will please many people is that if Open # 2, p or t is entered before calling the machine-code, the menu and prompts are still printed to the screen, but any Output — say, in Search and List, or List Variables — is sent to the selected channel.

The Editor: After much searching through Logan & O'Hara's book on the Spectrum Rom disassembly, I worked out how to call the internal Editor from machine-code. All Input is treated like Input Line — i.e. Caps 6 will return to Basic and no syntax check is made. Two added features are that the calling routine has to specify a length limit for any string, and that the empty string causes a return to the Menu. If the length limit is exceeded then the input is rejected and the editor is called again.

The Collect Number Routine: This uses the Editor to allow input up to five bytes. If any non-numeric characters are included, or the number is over 65535, then input is rejected and the Editor called again. Only positive whole numbers are allowed. If the first character is a "#", then characters A-F or a-f are also allowed, and a hex number is evaluated.

The Parameter subroutine: This is a bit of code that when called, uses the bytes following the call as instructions. Compare the Spectrum Rom's floating-point calculator. It calls the editor for input, prints strings and numbers on screen, as well as ordinary letters and messages from a table. It places input into buffers, and when all the prompts have been answered, tests to see if the values are valid. If all is well, it then asks if the routine should be executed. If you answer Y or y then the work is done. Some individual routines have further tests and error traps inside them.

The Renumber functions: Because of the way these programs correct Goto line numbers, they should not be used with programs that contain machine-code in Rem lines.

R — Renumber block of program: Renumbers a specified block — Start and first unaffected line numbers — with a new base — Destination — and Increment as specified by the user. It makes sure that line numbers will not overlap. It corrects purely integer, simple and up to four-figure numbers after Goto, Gosub, Llist, Run, Restore, and Line — as in Save a$ Line 100 — throughout the entire program. It also removes leading zeros in

Listing 1.

```
100 REM  PUT MACHINE CODE
110 CLEAR 59999
120 LET a=10: LET b=11: LET c=12: LET d=13: LET e=14:
LET f=15
130 LET line=1000
140 LET address=60000+(line-1000)*6.4
150 RESTORE line
160 READ a$,sum
170 LET tot=0
180 LET byte=16*VAL a$(1)+VAL a$(2)
190 LET tot=tot+byte
200 POKE address,byte
210 LET a$=a$(3 TO )
220 LET address=address+1
230 IF a$<>"" THEN GO TO 180
240 POKE 23692,255
250 IF sum=tot THEN PRINT "Line ";line;" OK.": LET li
ne=line+10: GO TO 150
260 PRINT "Error in Line ";line
270 BEEP .4,-10: BEEP .4,-16
280 STOP
490 ERASE "m";1;"Tool Load"
500 REM  SAVE LOADER
510 SAVE *"m";1;"Tool Load"
520 VERIFY *"m";1;"Tool Load"
530 STOP
600 REM  SAVE CODE
610 SAVE *"m";1;"Toolbytes"CODE 60000,5360
620 VERIFY *"m";1;"Toolbytes"CODE 60000,5360
630 STOP
1000 DATA [illegible]
...
9999 RANDOMIZE USR 60000
```

front of converted numbers. That is why it may appear a trifle slow.

M — Move block of program: This asks for the same four inputs as Renumber but instead of ensuring no overlap it checks the number of unused line numbers at the Destination. It renumbers your selected block as requested, then sorts the lines into the correct order. It therefore Moves the code and deals with all the Gotos etc.

C — Copy block of program: This asks for the same four inputs as Renumber. It copies the requested block at another point in the program and renumbers it. No Goto destinations in lines outside the new block are touched, but the new block is renumbered fully within itself. Any Gotos that point to before the original start of the copied block may be renumbered wrongly, but this is not a problem. Move the block you want copying to the front of the program, copy it, move it back, and all will be well.

R, M and C — Make sure there is enough memory: It is possible to get a Basic error report 4 Out of Memory and this can very rarely occur if the new line numbers after Gotos are longer — in terms of digits — than the old ones and there is no room to fit them in. This can only happen if the computer is near choc-a-bloc, but if it does, the program will be corrupted. Using function Y will leave something that can be worked with, unless copying when the system variables will have been corrupted — in which case, cry.

```
490
500 REM  SAVE LOADER
510 SAVE "Tool Load"
520 VERIFY "Tool Load"
530 STOP
600 REM  SAVE CODE
610 SAVE "Toolbytes"CODE 60000,5360
620 VERIFY "Toolbytes"CODE 60000,5360
630 STOP
```

For tape saving substitute these lines for lines 490-630 in listing 1.

When copying it is more likely that there will be insufficient space for the actual copying of lines, in which case no damage will have been done at all. In Move, it is more likely that memory will be full when the lines are being rearranged. Deleting a line or so and using function Z will put things right. This is all theoretical. It has never yet happened to me in practise.

The "correct corruption" routines: Y — Restore line lengths; Z — Sort lines into correct order; USR 65240 — Renumber 1,1. These have more uses than outlined under the above routines. Occasionally a program won't load very well from tape. Any attempt to edit lines results in a large number of program lines disappearing — or the computer crashing — because the Invisible Length bytes have been corrupted. Use Y and editing is possible. It could, however, spoil programs with machine-code in Rem lines if CHR$ 13 is contained in them.

Z sorts lines into their correct order. If line numbers are very badly corrupted, they may not be listed and will be rejected as program lines. Breaking back into Basic and calling USR 65240 will renumber the entire contents of the Program area from line 1, in steps of 1. No Gotos will be corrected. Because this can mess up a program it is made relatively hard to get at.

W — Disable New: This is the "Boss" routine for Diverted Interrupts. Functions N, Q and T are all routed through here, so that when they are on, the functions of W happen as well.

If you press key A in K mode, instead of getting New you will get Stop. If you hold down Symbol Shift and A in L mode, nothing will appear to happen. But the next key

(continued on next page)

(continued from previous page)

depression will be taken as K mode. Symbol Shift A followed by just A will give Stop. This is useful in functions A and S, avoiding having to do Then keyword backspace Delete forwardspace.

N — Autoline Number: Prompts for Increment. When awaiting a Basic line to be entered, adds the Increment value to the existing current line and inserts that number in the Edit line. It only works if the last key pressed was Enter. It will very rarely append to a line after a syntax error — you'll just have to delete. Note that Q, T, W and X all turn this utility off.

Q — Constant memory: Gives a constant display of memory left. Is turned off by N, T, W and X.

T — Trace — Continuous display of current program line: This function prompts for speed. 100 is close to normal running speed. As the number is reduced, the program runs considerably slower. So if there is something wrong with your program you can get a rough idea why. When this function is in operation, you can skip through part of your program at normal speed by holding down Enter and K together. You can freeze the program by holding Enter and L together. Trace is turned off by N, Q, W and X.

X — Return interrupts to normal: Switches off N, Q, T and W. You can now New if you wish!

A — Search and replace: This prompts for Start and Finish line numbers. It then asks for Old and New strings. String in this sense means a string of characters from the program. They do not have to be the same length. There is also a List option (not advisable when there will be a large number of alterations). If the string to be altered contains floating point numbers, tell the program by preceding and following the number with three "&" signs. For example:

```
OLD STRING: *"m";&&&1&&&;" NEW STRING:"
```

would allow you to change Microdrive commands for tape. If "&&&" is part of a non-numeric string, this feature would not work further down the line. It also works in the New String. There is a maximum string length, including &'s, of 32 characters. To use the Bin character, place &&& before the Bin and after the bits. If the number is too large, a return to Basic is made with error 6. Error 4 is also possible but no damage will have been done.

B — Machine code to data: This prompts for start and finish addresses, a destination and number of bytes per line. Lines are formed incrementing by one. It gives the option of hex in the same form as line 1000 onwards in listing 1 or Decimal numbers. Only the hex form gives a checksum. A memory check is made before each line is started to ensure that the program is not corrupted by unfinished lines.

Error Reports.

Error message	May occur in
Task completed	Most routines: it means it's done as told
Range error	B, C, M, N, R, T, U. Increment > 100
Numbers reversed	A B C D J K L M P R · S. Start > Finish
Invalid line number	Line > 9996. Non-existent line in O.
Zero not allowed	C M N R T U. Speaks for itself.
Lines would overlap	R. Check what you are trying to do.
No room at destination	B C E M. Not enough unused line numbers.
Zero block!	C D. No actual lines from start to finish

A check is also made to ensure that there are enough unused line numbers at the destination. Of course, machine code occupying the same space as the Toolkit will have to be moved before the Toolkit is loaded but that is simple enough.

U — UDGs to data: This is the same as function "B" but is an easier way of working if you want to put any UDGs — perhaps produced by function G — into Data lines. It asks for the number of UDGs required — starting from A — so 4 gives graphic A, B, C and D — and the number of the first Data line. It puts eight bytes on each line.

D — Delete block of program: This is obvious. Enter first line and finish line as prompted. It is very quick indeed.

E — Create a Rem line: This can create a Rem line of 35,000 characters in less than a second. Useful for those without Interface 1 who enter their machine code that way. Prompts for Line Number, Length, and Symbol.

F — Delete Rem lines: Prompts for Start and Finish line numbers. Deletes Rem lines in specified range only, including :Rem further down a line. Does not deal with If a Then Rem but who is that daft?

G — UDG Designer: Prompts for a character to be used as a starting point. This is then amended by entering the co-ordinates of a point on an 8 by 8 grid — number first — followed by i for fill in and o for rub out. Mirror images, inversions and rotations can also be made. Finally, the UDG is entered into a specified letter.

H — Hex/Decimal conversions: Will print any number input in both hex and decimal. As all numbers 0-65535 can be entered in either hex or decimal — see above under Collect Number routine — this is useful. It

Listing 2.

```
   1
   2 REM Lines   9997-9999   are    referred to as LI
STing 2 in    the text. LISTing 3 is, of  course,
 the first program     on this tape"
   3
9997 STOP : ERASE "m";1;"Toolkit": ERASE "m";1;"Toolby
tes": SAVE *"m";1;"Toolkit": VERIFY *"m";1;"Toolkit":
SAVE *"m";1;"Toolbytes"CODE 60000,5368: VERIFY *"m";1;
"Toolbytes"CODE : STOP
9998 CLEAR 59999: LOAD *"m";1;"Toolbytes"CODE 60000: S
TOP
9999 RANDOMIZE USR 60000
```

keeps prompting for more numbers. Return to menu using Empty String.

I — Status report: Gives a report of memory left, whether interrupts are normal or diverted, printout of UDGs provided channel s or p is in use, plus a few other bits. A command can be entered without returning to the menu.

J — Merge block of lines: Will merge together a specified block of lines as one line. Watch out for Goto destinations, Rem lines, and the fact that the Spectrum only allows 127 commands on a line.

K — Lower to upper case and L — upper to lower case: Will convert letters inside a program between two specified lines. Note that there is an option to include or exclude characters inside string quotes.

O — Token locate: This gives the address in both decimal and hex of the first symbol after the Line Number and Length Pointer in a specified line. Gives an error if the line does not exist.

P — Compact program: Does usual prompts for specified program block. Then deletes any unnecessary characters — i.e, spaces and colour controls outside quotes. It ignores lines that start with Rem but does affect messages after Rems if it is not the very first symbol on the line.

S — Search and List: This is the opposite to function A in how it deals with floating-point forms. It searches the lines and prints them in accordance with how they look when listed so you don't have to worry about hidden characters. It prompts for Start and Finish line numbers, and the string of characters to be searched for — maximum length 32.

V — List variables: Does what it says. All simple variables are given with their values, except that CHR$ 0-31 in string variables are printed as "?". For-Next variables are printed in capitals with their values, and Dimensioned variables are printed with their dimensions but no values.

Warning — Line 9999: If at any time there is an attempt to append to the existing program — i.e., creating lines after the last one present — using functions B, C, E, M or U, then although the functions will appear to work, the new lines will be formed in the variables area, and the computer will not work properly until you Clear it. Also Renumber relies on the fact that Line 9999 is present to ensure that if doesn't form invalid line numbers. So always ensure that at least Line 9999 is present in a program before using the Toolkit.

All prompts requiring line numbers actually reject anything above 9996. I append two suggested ideas for lines 9997 to 9999 depending on whether you are a Microdrive owner or not. Note that it is unwise to use Autorun on the Microdrive version as you would be unable to Merge the control lines with your existing program.

Lines 1000 upwards of listing 1 were produced by the toolkit. Type in listing 1. Save it by Run 500. Run the program. If all is well you will end up with Report E. Once okay, save it by Run 490 and save the Code also — Run 600. Rand USR 60000 should give you a nice title page. Use Caps 6 to return to Basic, then do a New then enter listing 2 or 3 as appropriate. Now Run 9997, then continue. ■

Listing 3.

```
9997 STOP : SAVE "Toolkit" LINE 9998: SAVE "Toolbytes"
CODE 60000,5368: VERIFY "Toolkit": VERIFY "Toolbytes"C
ODE : STOP
9998 CLEAR 59999: LOAD "Toolbytes"CODE 60000: STOP
9999 RANDOMIZE USR 60000
```

THE AIM OF this and the next article is to describe the construction of a compiler system for BBC Basic that is suitable for use on the BBC and Electron computers. The limitations on the amount of memory available on these machines mean that it is not possible for the program to compile all of BBC Basic — instead only a subset is treated but this is more extensive than that handled by some commercially available compilers. This subset is shown in figure 1. I shall refer to it as TC — Tiny Compiled — Basic.

TC Basic consists of two programs; the compiler which is a large Basic program and the run time system — RTS — which is a hybrid machine code — Basic program. This article will describe the compiler while the subsequent one will contain a description of the assembly language program that generates the RTS: this is called the run time system generator — RTSG.

The aim of a compiler, is to convert a program written in a high-level language like BBC Basic into a much simpler one like machine code which will therefore run faster. A program compiled by the TC Basic compiler will run as fast as a Forth program — ie., four to five times faster than the usual interpreted BBC Basic.

The code version of a program is rather more compact than the original Basic program and, typically, at least 10K of code can be generated on a BBC micro — for the Electron 4K would be a reasonable estimate.

The compilers usually implemented on mainframe and minicomputers take the high-level program and convert it into machine code. However, for the BBC computer this approach has the disadvantage that the 6502 CPU chip does not have instructions to do many of the things one would like it to.

For instance, there are no instructions to add two 16 bit numbers or for multiplication. To get round this I have invented a "virtual machine". This is an idealised CPU which has instructions to do all the things required. It is implemented as a 6502 machine-code program. The compiler produces machine-code for this virtual machine; such code is usually called pseudo-code or more briefly, p-code.

The machine-code to interpret the p-code, is contained in the RTS and this is, of course, the main purpose of this program. The use of p-code has some advantages and some disadvantages. The chief advantage is that it makes the compiler and run time system a bit less complex. A further advantage is that compiled programs are very compact. The chief disadvantage is that p-code executes about three times slower than machine code.

An alternative to p-code would be to compile the Basic program into 6502 machine-code statements. Every time some feature not in the 6502 instruction set was required we could jump to a subroutine in a run time support system. Simple functions like addition could be implemented as in line code. The major advantage of this approach is that programs run faster. However, there is the disadvantage that programs are very long; perhaps three to four times the length of an equivalent p-code program.

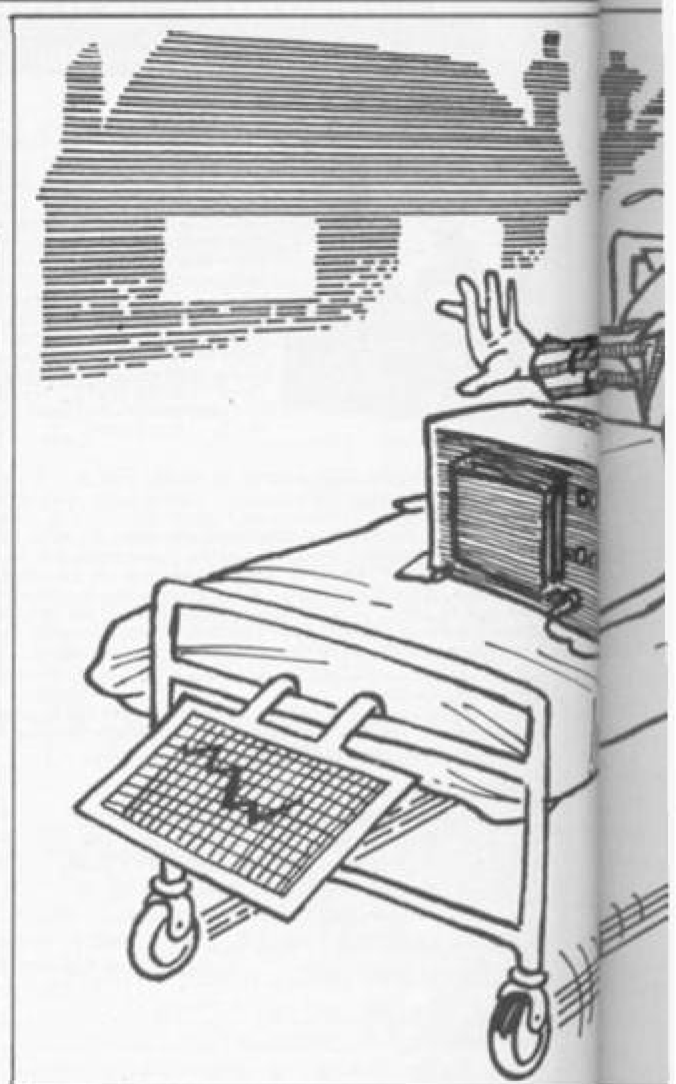
All the components of a p-code system are used by a true machine-code compiler. It is therefore worth starting with such a system if you want to learn how to make a compiler work.

The TC Basic compiler is shown in the listing. Obviously, if you want a TC Basic system, begin by typing in this listing. It should be Saved before you try Running it. In addition, before you can declare the compiler finished, it is necessary to enter in line 120 the value of the address in memory of the top of the RTS. This number, is provided by the RTSG program to be described in part 2.

The following is a desciption of the major components of the compiler. The main program runs between lines 150 and 300. Line 150 calls Procsetup — line 560. This initialises the values of various variables; in particular, it gives a large number of them the values of the Basic tokens which correspond to the keywords the compiler needs to know about. Procsetup also calls Proctok — lines 380 to 540 — which assembles a small machine-code program which is used to print out keywords from their tokens in the listings of programs. In addition, Procsetup prompts the user to specify the sizes of various things and reserves the appropriate quantities of memory.

Line 160 is a call of Procopen — lines 940 to 1020 — which opens the file containing the program to be compiled. Once the file is open, characters are always read from it by using FNCH — line 1020. Line 170 set things up so that compilation can start and in line 180, the call of Procprog actually initiates the compilation process. After the program has been compiled, execution of the main program continues at line 190. Lines 190 to 210 check if the storage allocations have been exceeded and print error messages if this is the case.

At line 220, a check is made to see if there have been any errors so far. If there have, the program branches to line 290: this is where



COMP

the compiler ends if there are errors; a message is printed out giving the number of errors.

At this point, the compiler has constructed a p-code version of the Basic program. However, there are no actual addresses in this for either variables or for Goto — or in p-code jump — statements to branch to. To complete the p-code program it must be "fixed up". This is done by Procfix — lines 4050 to 4230 — and its associated routines in lines 3950 to 4280. This procedure allocates memory to variables and finds out the addresses in code to which Gotos, procedures and functions correspond. While the code is being fixed up, it is also relocated so that it will run at the address corresponding to the top of the RTS. Hence the reason why the value of this must

Figure 1. TC Basic Specification

Variables:
2 byte signed integers.
Variable names may contain up to 255 characters and may end with a %. The variables A% to Z%, use the same memory locations as the usual Basic system variables thus allowing programs to pass information, and enabling parameter passing to the Call statement.
Arrays:
Multiple dimension arrays of 2 byte signed integers.
Arithmetic Operators: +, −, *, /, DIV, MOD
Logical Operators: AND, OR, EOR, NOT
Relational Operators: =, <, >, >=, <=, <>
Indirection Operator: ? (right hand side operand only)
Statements:
FOR TO STEP NEXT (no variable allowed after NEXT)
REPEAT UNTIL
PRINT"string" ' variable / expression, TAB(X,Y) ;
IF THEN ELSE
VDU , ;
* string (send string to OSCLI)
GOTO line number
SOUND ENVELOPE
MODE GCOL COLOUR CLS CLG MOVE
DRAW PLOT
CALL END
DIM array / vairable
System variables / functions:
INKEY GET TRUE FALSE
ADVAL TIME ABS SGN
POS VPOS POINT SQR RND()
Procedures / functions:
DEFPROC PROC ENDPROC
DEFFN FN =
procedure and function arguments are not supported but procedures and functions can be used recursively.
In addition, the following are supported: REM, () (brackets), = (asignment), : (for multi-statement lines), integer constants, + and − (unary sign operators), & (for hex constants).



D J Piling with a compiler for the BBC.

PILER

be known.

Finally, if no errors occur in the fix up process the compiler ends at line 260; this calls Procdump — lines 1040 to 1180 — to save the code produced.

Some other features of the compiler are worth describing. The procedures in lines 1230 to 1900 compose the lexical analyser. Every time Proclx — lines 1230 to 1360 — is called, it reads the text token from the program and puts its type in the variable T%. Here "token" does not refer to the usual BBC Basic keyword token. Instead, it means the next significant piece of the program. Therefore, tokens can be variables and strings.

As was stated earlier, in a p-code system one constructs a virtual machine. In TC Basic the virtual machine is stack-based. This means that all operations take place either to or from the stack. For instance, there is an operation Add which takes a variable and adds it to the top element of the stack the result of the addition becoming the new top of stack element.

When the syntax analysis requires that a variable be added to the stack it calls Procadd. This writes the opcode for Add (2) into the code space and follows it with the address of the variable. In fact, until fix up instead of the variables address its number in the symbol table is used.

Other code generating subroutines, are supplied for all the operations the virtual machine is required to perform.

A typical scenario for the use of the compiler would be as follows: First, the program is developed as usual using the TC Basic subset to BBC Basic with the BBC Basic interpreter and Saved. Next, the compiler is Loaded and Run. It then asks for three pieces of information; the number of variables, the number of line numbers and the code space in bytes for the program to be compiled. Typically, answers of 100, 100 and 2000 would suffice for a small program. It is important to note that the number after a Goto counts as a variable as do the names of functions and procedures. Thus you must be careful when calculating how many variables to reserve space for.

Next, the compiler will ask you for the name of the program to be compiled. This will then be read in off the tape. This can in fact lead to a slight problem since, the compiler, is treating a program file as a data file. On a cassette-based system they are written to tape with different inter-block gaps.



This article is available on the Telsoft service.

With some cassette recorders having the wrong gap will lead to filing system errors when the program is being read in. The solution to this problem; if it happens to you, is to define one of the function keys as follows:

*KEY0 *OPT,1 IIM INPUT " "FILE NAME "A$:X% = OPENOUTA$: FORI% = PAGE TO TOP-1: BPUT # X%, ?I%: NEXT: CLOSE # X%: *OPT IIM

f0 is then used for saving programs to be *compiled*.

As the program is compiled, it will be listed out on the screen. If any errors are found there will be a break in the listing and an appropriate error message. If enough room has not been reserved for variables code or lines you will be informed of the amount of space needed for the.

Finally, if there are no errors in compilation, a copy of the code equivalent of the Basic program can be saved. This will automatically be given the name C.name-of-compiled-program.

To execute the program, this new code file must be loaded into the RTS. The construction of this will be described in part 2. A C30 containing the listings from both articles, TC Basic systems set up for both tape and disc based computers and example programs and code files is available from D. J. Pilling, 12 Cherrywood Avenue, Anchorsholme, Blackpool. FY5 1SU. in return for a cheque for £2.99.

```
10REM ----------------------------------
20REM
30REM TC BASIC COMPILER
40REM D. J. Pilling
50REM (c) January 1985
60REM
70REM ----------------------------------
80
90REM enter value for top of RTS in
100REM line 120.
110
120toprts=7040
130
140MODE7:PROCT
150PROCSETUP
160PROCOPEN
170T%=FNCH:A%=FNCH:PROCLX
180PROCprog:CLOSE#Z%
190IFNL%>ML% PROCEM(5)
200IFNB%>MB% PROCEM(4)
210IFE%<C%+MC% PROCEM(6)
220IFEN% GOTO290
230PROCFIX
240IFEN% GOTO290
250
260PROCNE:PROCDUMP
270END
280
290PROCEE
300END
310
320DEFFNL(B1%,B2%,B3%)
330B3%=B3%*256+B2%-&4840
340IFB1%MOD16=0 B3%=B3%+16384:B1%=B1%+4
350IFB1%=&44 B1%=64 ELSEIFB1%=&54 B1%=0 ELSEIFB1%=&6
4 B1%=192 ELSEIFB1%=&74 B1%=128
360=B1%+B3%
370
380DEFPROCTOK
390IFTV&0015=5B0%=&7FF1 ELSEB%=&7FED
400B%=&82ED:DIMTK 100
410FORI%=0TO3STEP2:P%=TK:[OPTI%
420CMP#128:BCC K%:BEQ L%
430TAX:LDA#B%DIV256:STA&71:LDA#B%MOD256:STA&70:LDY#1
20
440.D% TXA:CMP(&70),Y:BEQ C%
450INC &70:BNE D%:INC &71
460LDA&71:CMP #B%DIV256:BNE D%
470LDA&70:CMP #B%MOD256:BNE D%:BEQ F%
480.C% LDX#0
490.H% DEY:INX:LDA(&70),Y:CMP#127:BCC H%
500INY:INY:DEX:DEX:TXA:CMP#9:BCS F%
510.E% LDA(&70),Y:JSR &FFEE:INY:DEX:BNE E%
520.F% RTS:.K% JSR &FFEE:RTS
530.L% LDA#&5:JSR &FFEE:LDA#70:JSR &FFEE:LDA#&8:JSR
&FFEE:RTS:]:NEXT
540ENDPROC
550
560DEFPROCSETUP
570PROCTOK
580PRINT"SELECT STORAGE ALLOCATIONS"
590INPUT''"ENTER MAX. NUMBER OF LINES"''"NOT LESS THAN
10 >"ML%
600IFML%<10GOTO590
610INPUT''"ENTER NUMBER OF VARIABLES"''"BETWEEN 5 AND
256 );"MB%
620IF MB%>256 OR MB%<5 GOTO610
630INPUT''"ENTER SIZE OF CODE SPACE IN BYTES"''"NOT LE
SS THAN 100 >"MC%
640IF MC%<100 GOTO630
650DIM B$(MB%),B% 3*MB%,L% 4*ML%
660B$=STRING$(40," ");B$=""
670NL%=0:NB%=0:BN%=0:EN%=0:EL%=0
680DIM C% MC%:C%=C%+4
690RL%=toprts-C%+4:MC%=MC%-4
700P%=C%:E%=C%+MC%
710for=&E3:to=&B8:step=&88:next=&ED
720vdu=&EF:print=&F1:tab=&8A:proc=&F2
730def=&DD:endproc=&E1:rem=&F4
740goto=&E5:and=&80:inkey=&A6:if=&E7
750else=&8B:line=&86:then=&8C:dim=&DE
760eq=&3D:geq=&1:leq=&2:gt=&3E:lt=&3C
770neq=&3:lb=&28:rb=&29:tr=&B9:fl=&A3
780plus=&2B:minus=&2D:slash=&2F
790times=&2A:pling=&3F:squote=&27
800dquote=&22:comma=&2C:scol=&3B
810col=&3A:spc=32:eoln=&D:eop=&FF
820geq=&1:leq=&2:neq=&3:id=&4:lbl=&5
830const=&6:string=&7:rep=&F5:unt=&FD
840mod=&83:div=&81:sound=&D4:er=&8
850and=&80:or=&84:eor=&82:fn=&A4
860time1=&D1:timer=&91:pc=37:ap=38
870mode=&EB:cls=&DB:clg=&DA:gcol=&E6
880colour=&FB:draw=&DF:move=&EC:plot=&F0
890rnd=&B3:sqr=&B6:sgn=&B4:abs=&94
900get=&A5:adv=&96:pos=&B1:vpos=&BC
910pol=&B0:call=&D6:not=&AC:env=&E2
920ENDPROC
930
940DEFPROCOPEN
950*OPT1,1
960*OPT2,1
970PRINT''"ENTER NAME OF PROGRAM TO"
980INPUT"COMPILE >"F$
990Z%=OPENUPF$
1000PRINT''"START OF COMPILATION"''
1010*OPT1,0
1020ENDPROC
1030
1040DEFPROCDUMP
1050IFLENF$>8 F$=LEFT$(F$,8)
1060F$="C."+F$
1070PRINT''"READY TO SAVE CODE";F$
1080PRINT"SAVE CODE ? Y/N ";
1090I%=GET:IF I%=ASC"Y" ELSEIF I%=ASC"N"GOTO1170 ELSE
1090
1100PRINT''
1110*OPT1,1
1120X%=OPENOUTF$
1130PRINT#X%,C%,F%,E%,F$
1140FOR I%=C%-4 TO E%:BPUT#X%,?I%:NEXT
1150CLOSE#X%
1160GOTO1070
1170*OPT
1180PRINT'':ENDPROC
1190
1200DEFFNCH:=BGET#Z%
1210DEFPROCA:CALL TK:A%=FNCH:ENDPROC
1220
1230DEFPROCLX
1240IFEL% T%=0:ENDPROC
1250IFT%=eop:ENDPROC
1260IFT%=eoln PROCNL
1270IFA%=spc:REPEAT PROCA:UNTILA%<>spc
1280IFNOTFNAL(A%) GOTO1320
1290PROCID:IFA%=pc B$=B$+"%":PROCA
1300IFA%=lb T%=ar ELSET%=id
1310PROCB:ENDPROC
1320IFA%<>proc ANDA%<>fn GOTO1350
1330T%=A%:PROCA:IFNOTFNAL(A%) T%=0:ENDPROC
1340PROCID:PROCB:ENDPROC
1350IF FNDN(A%) PROCDNO ELSEIF A%=ap PROCA:PROCHNO EL
SEIF A%=rem PROCRO ELSEIF A%=dquote PROCSO ELSEIF A%=l
ine PROCLB ELSEPROCTS
1360ENDPROC
1370DEFFNAL(A%):=(A%>64ANDA%<91)OR(A%>96ANDA%<123)
1380DEFFNDN(A%):=(A%>47ANDA%<58)
1390DEFFNHN(A%):=(A%>47ANDA%<58)OR(A%>64ANDA%<71)
1400DEFPROCLB
```

(listing continued on next page)

(listing continued from previous page)

```
1410BN%=FNL(FNCH,FNCH,FNCH)
1420T%=lino:A%=FNCH:$$=STR$N%
1430PROCB
1440PRINT;N%;
1450ENDPROC
1460DEFPROCID
1470$$="":REPEAT:$$=$$+CHR$A%:PROCA:UNTIL NOT(FNDN(A%)ORFNAL(A%))
1480ENDPROC
1490DEFPROCDNB
1500N%=0:REPEAT N%=N%*10:N%=N%+A%-ASC"0":PROCA:UNTILNOTFNDN(A%)
1510T%=const
1520ENDPROC
1530DEFPROCHNB
1540N%=0:REPEAT N%=N%*16
1550IFFNDN(A%) N%=N%+A%-ASC"0":PROCA ELSEIFFNHH(A%) N%=N%+A%-ASC"A"+10:PROCA
1560UNTILNOTFNHH(A%)
1570T%=const
1580ENDPROC
1590DEFPROCRB
1600REPEAT PROCA:UNTILA%=eoln:T%=A%:PROCA
1610ENDPROC
1620DEFPROCSB
1630$$="":PROCA
1640REPEAT:$$=$$+CHR$A%:VDUA%:A%=FNCH:UNTIL A%=dquote ORA%=eoln:IFA%=eoln PROCEM(1) ELSE PROCA
1650IFA%=dquote GOTO1640
1660T%=string
1670ENDPROC
1680DEFPROCCLIB
1690$$=CHR$A%
1700REPEAT:PROCA:$$=$$+CHR$A%:UNTIL A%=eoln:T%=A%:PROCA
1710ENDPROC
1720DEFPROCTB
1730T%=A%:PROCA
1740IFT%=gt ANDA%=eq T%=geq:PROCA
1750IFT%=lt ANDA%=eq T%=leq:PROCA
1760IFT%=lt ANDA%=gt T%=neq:PROCA
1770IFT%=col ANDA%=col REPEATPROCA:UNTIL(A%<>col)AND(A%<>spc)
1780IFT%=col ANDA%=eoln:T%=A%:PROCA
1790ENDPROC
1800DEFPROCNL
1810IFA%=eop:ENDPROC
1820LI%=A%*256+FNCH:LL%=FNCH
1830IFNL%>ML% EN%=EN%+1:GOTO1800
1840L%?(NL%*4)=LI%DIV256
1850L%?(NL%*4+1)=LI%MOD256
1860L%?(NL%*4+2)=P%DIV256
1870L%?(NL%*4+3)=P%MOD256
1880NL%=NL%+1
1890PRINT';LI%; TAB(4);:A%=32
1900ENDPROC
1910
1920DEFPROCB
1930IF NB%>MB% EN%=EN%+1:ENDPROC
1940BN%=-1:REPEAT BN%=BN%+1
1950UNTIL ($$(BN%)=$$ AND B%?(3*BN%)=T%) OR $$(BN%)=""
1960IF$$(BN%)="" $$(BN%)=$$:NB%=NB%+1:B%?(3*BN%)=T%:B%?(3*BN%+1)=0:B%?(3*BN%+2)=0
1970ENDPROC
1980
1990DEFPROCprog
2000IFT%=eop PROCEND:ENDPROC
2010PROCstate:IFT%=col ORT%=eoln PROCLX:GOTO2000
2020ENDPROC
2030DEFPROCdef:PROCEND
2040PROCLX:IFT%<>proc ANDT%<>fn PROCC(proc)
2050B%?(3*BN%+1)=P%DIV256
2060B%?(3*BN%+2)=P%MOD256
2070IFT%=fn PROCLX:GOTO2120
2080PROCLX
2090IFT%=eop ORT%=endproc GOTO2110
2100PROCstate:IFT%=col ORT%=eoln PROCLX:GOTO2090
2110PROCC(endproc):PROCLX:PROCRTS:ENDPROC
2120IFT%=eop ORT%=eq GOTO2140
2130PROCstate:IFT%=col ORT%=eoln PROCLX:GOTO2120
2140PROCC(eq):PROCLX:PROCexp:PROCRTF:ENDPROC
2150
2160DEFPROCstate
2170IFT%=eoln ORT%=col ORT%=else:GOTO2450
2180IFT%=id PROCassign:GOTO2450
2190IFT%=ar PROCarassign:GOTO2450
2200IFT%=pling PROCassign:GOTO2450
2210IFT%=timel PROCtassign:GOTO2450
2220IFT%=proc PROCproc:GOTO2450
2230IFT%=rep PROCrep:GOTO2450
2240IFT%=vdu PROCvdu:GOTO2450
2250IFT%=if PROCif:GOTO2450
2260IFT%=for PROCfor:GOTO2450
2270IFT%=goto PROCgoto:GOTO2450
2280IFT%=print PROCprint:GOTO2450
2290IFT%=end PROCend:GOTO2450
2300IFT%=def PROCdef:GOTO2450
2310IFT%=sound PROCsound:GOTO2450
2320IFT%=env PROCenv:GOTO2450
2330IFT%=call PROCcall:GOTO2450
2340IFT%=dim PROCdim:GOTO2450
2350IFT%=times PROCCLIB:PROCCLI:GOTO2450
2360IFT%=mode PROCmode:GOTO2450
2370IFT%=colo PROCcolo:GOTO2450
2380IFT%=gcol PROCgcol:GOTO2450
2390IFT%=move PROCmove:GOTO2450
2400IFT%=draw PROCdraw:GOTO2450
2410IFT%=plot PROCplot:GOTO2450
2420IFT%=cls PROCLX:PROCVDL(12):GOTO2450
2430IFT%=clg PROCLX:PROCVDL(16):GOTO2450
2440PROCEM(7):PROCELP
2450IFEL% PROCELP
2460IF(T%<>eoln ANDT%<>col ANDT%<>else) PROCEM(7):PROCELP
2470ENDPROC
2480
2490DEFPROCend:PROCEND:PROCLX:ENDPROC
2500DEFPROCassign:LOCALST%:ST%=BN%
2510PROCLX:PROCC(eq):PROCLX:PROCexp
2520PROCSTA:PROCADR(P%-3,ST%):ENDPROC
2530DEFPROCarassign:LOCALST%:ST%=BN%
2540PROCgma:PROCC(eq):PROCLX:PROCexp
2550PROCSTM:PROCADR(P%-3,ST%):ENDPROC
2560DEFPROCpassign:PROCLX:PROCexp:PROCC(eq):PROCLX:PROCexp:PROCSTI:ENDPROC
2570DEFPROCtassign:PROCLX:PROCC(eq):PROCLX:PROCexp:PROCSTT:ENDPROC
2580DEFPROCproc:PROCJSR:PROCADR(P%-3,BN%):PROCLX:ENDPROC
2590DEFPROCfn:PROCJSR:PROCADR(P%-3,BN%):PROCLX:ENDPROC
2600DEFPROCvdu
2610PROCLX
2620PROCexp:IFT%=scol PROCVDD ELSEPROCVDU
2630IFT%=comma GOTO2610 ELSEIFT%=scol PROCLX:IFFNEXP GOTO2620
2640ENDPROC
2650DEFPROCif:LOCAL LI%,L2%
2660PROCLX
2670PROCexp
2680LI%=P%:PROCJMC
2690IFT%=then PROCLX:IFT%=lino PROCJMP:PROCADR(P%-3,BN%):PROCLX:GOTO2710
2700PROCstate
2710IFT%=col:PROCLX:GOTO2700
2720IFT%<>else PROCADR(LI%,P%):ENDPROC
2730L2%=P%:PROCJMP:PROCADR(LI%,P%)
2740PROCLX
2750IFT%=lino PROCJMP:PROCADR(P%-3,BN%):PROCLX:GOTO2770
2760PROCstate
2770IFT%=col:PROCLX:GOTO2760
2780PROCADR(L2%,P%)
2790ENDPROC
2800DEFPROCfor:LOCAL ST%:PROCLX
2810PROCC(id):ST%=BN%:PROCLX
2820PROCC(eq):PROCLX:PROCexp
2830PROCSTA:PROCADR(P%-3,ST%)
2840PROCC(to):PROCLX:PROCexp
2850IFT%=step PROCLX:PROCexp ELSEPROCLDL(1)
2860PROCLX:PROCFIR:PROCADR(P%-3,ST%)
2870IFT%=eop ORT%=next GOTO2890
2880PROCstate:IFT%=col ORT%=eoln PROCLX:GOTO2870
2890PROCC(next):PROCLX:PROCNXT:ENDPROC
2900DEFPROCgoto:PROCLX:PROCC(lino):PROCJMP:PROCADR(P%-3,BN%):PROCLX:ENDPROC
2910DEFPROCprint:LOCALT1%
2920T1%=T%:PROCLX
2930IFT%=aquote PROCVDL(13):PROCVDL(10):GOTO2920
2940IFT%=scol GOTO2920
2950IFT%=string PROCSTR:GOTO2920
2960IFT%=comma PROCVDL(32):GOTO2920
2970IFT%=tab T1%=T%:PROCVDL(31):PROCLX:PROCexp:PROCC(comma):PROCLX:PROCVDU:PROCexp:PROCC(rb):PROCLX:PROCVDU:GOTO2930
2980IFFNEXP T1%=id:PROCexp:PROCPRI:GOTO2930
2990IFT1%<>scol PROCVDL(13):PROCVDL(10)
3000ENDPROC
3010DEFFNEXP:=T%=plus ORT%=minus ORT%=id ORT%=lb ORT%=pling ORT%=const ORT%=inkey ORT%=timer ORT%=tr ORT%=fl ORT%=sqr ORT%=rnd ORT%=sgn ORT%=abs ORT%=get ORT%=adv ORT%=pos ORT%=vpo ORT%=poi ORT%=not ORT%=fn ORT%=ar
3020DEFPROCSTR
3030IFLEN$$=1 PROCVDL(ASC$$) ELSE PROCVDS
3040ENDPROC
3050DEFPROCexp:PROCIterm
3060IFT%=or PROCLX:PROCIterm:PROCORA:GOTO3060 ELSEIFT%=eor PROCLX:PROCIterm:PROCEOR:GOTO3060
3070ENDPROC
3080DEFPROCIterm
3090PROCIfact
3100IFT%=and PROCLX:PROCIfact:PROCAND:GOTO3100
3110ENDPROC
3120DEFPROCIfact:LOCAL T1%:PROCsexp
3130IFT%<>gt ANDT%<>lt ANDT%<>geq ANDT%<>leq ANDT%<>eq ANDT%<>neq GOTO3160
3140T1%=T%:PROCLX:PROCsexp
3150IFT1%=gt PROCGTT ELSEIFT1%=lt PROCLTT ELSEIFT1%=geq PROCGEQ ELSEIFT1%=leq PROCLEQ ELSEIFT1%=eq PROCEQU ELSEIFT1%=neq PROCNEQ
3160ENDPROC
3170DEFPROCsexp
3180IFT%=plus PROCLX:PROCterm ELSEIFT%=minus PROCLX:PROCterm:PROCNEG ELSE PROCterm
3190IFT%=plus PROCLX:PROCterm:PROCADD:GOTO3190 ELSEIFT%=minus PROCLX:PROCterm:PROCSUB:GOTO3190
3200ENDPROC
3210DEFPROCfactor:LOCAL ST%:ST%=BN%
3220IFT%=id PROCLX:PROCLDA:PROCADR(P%-3,ST%):ENDPROC
3230IFT%=ar PROCgma:PROCLDM:PROCADR(P%-3,ST%):ENDPROC
3240IFT%=const PROCLX:PROCLDL(N%):ENDPROC
3250IFT%=pling PROCLX:PROClera:PROCLDI:ENDPROC
3260IFT%=timer PROCLX:PROCLDT:ENDPROC
3270IFT%=fn PROCfn:ENDPROC
3280IFT%=lb PROCLX:PROCexp:PROCLX:ENDPROC
3290IFT%=inkey PROCLX:PROClera:PROCINK:ENDPROC
3300IFT%=sqr PROCLX:PROClera:PROCSQR:ENDPROC
3310IFT%=sgn PROCLX:PROClera:PROCSGN:ENDPROC
3320IFT%=abs PROCLX:PROClera:PROCABS:ENDPROC
3330IFT%=adv PROCLX:PROClera:PROCADV:ENDPROC
3340IFT%=poi PROCLX:PROCexp:PROCC(comma):PROCLX:PROCexp:PROCC(rb):PROCLX:PROCPOI:ENDPROC
3350IFT%=rnd PROCLX:PROCC(lb):PROCLX:PROCexp:PROCC(rb):PROCLX:PROCRND:ENDPROC
3360IFT%=tr PROCLX:PROCLDL(&FFFF):ENDPROC
3370IFT%=get PROCLX:PROCGET:ENDPROC
3380IFT%=pos PROCLX:PROCPOS:ENDPROC
3390IFT%=vpo PROCLX:PROCVPO:ENDPROC
3400IFT%=fl PROCLX:PROCLDL(0):ENDPROC
3410IFT%=not PROCLX:PROClera:PROCNOT:ENDPROC
3420PROCC(1)
3430ENDPROC
3440DEFPROCterm
3450PROCfactor
3460IFT%=times PROCLX:PROCfactor:PROCMUL:GOTO3460 ELSEIFT%=slash PROCLX:PROCfactor:PROCDIV:GOTO3460
3470IFT%=div PROCLX:PROCfactor:PROCDIV:GOTO3460 ELSEIFT%=mod PROCLX:PROCfactor:PROCMOD:GOTO3460
3480ENDPROC
3490DEFPROClera
3500IFT%=plus PROCLX:PROCfactor ELSEIFT%=minus PROCLX:PROCfactor:PROCNEG ELSE PROCfactor
3510ENDPROC
3520DEFPROCsound
3530PROCLX:PROCexp:PROCC(comma)
3540PROCLX:PROCexp:PROCC(comma)
3550PROCLX:PROCexp:PROCC(comma)
3560PROCLX:PROCexp:PROCSND:ENDPROC
3570DEFPROCenv
3580LOCAL I%:FOR I%=1TO13
3590PROCLX:PROCexp:PROCC(comma):NEXT
3600PROCLX:PROCexp:PROCENV:ENDPROC
3610DEFPROCcall:PROCLX:PROCexp:PROCCAL:ENDPROC
3620DEFPROCdim:LOCAL ST%
3630PROCLX:IFT%<>ar GOTO3660
3640ST%=BN%:IF B%?(BN%*3+1)<>0 PROCEM(8):PROCELP:ENDPROC
3650PROCgma:PROCLDL(B%?(ST%*3+2)):PROCDMA:PROCADR(P%-3,ST%):B%?(ST%*3+1)=1:GOTO3680
3660IFT%<>id ENDPROC
3670ST%=BN%:PROCLX:PROCexp:PROCDMM:PROCADR(P%-3,ST%)
3680IFT%=comma:GOTO3630
3690ENDPROC
3700DEFPROCgma:LOCAL I%
3710PROCLX:PROCLX:I%=B%?(ST%*3+2):IFI%=0:I%=1:GOTO3740
3720REPEAT I%=I%-1:PROCexp:IFI%<>0 PROCC(comma):PROCLX
3730UNTILI%=0:PROCC(rb):PROCLX:ENDPROC
3740PROCexp:IFT%=comma:I%=I%+1:PROCLX:GOTO3740 ELSEPROCC(rb):PROCLX:B%?(ST%*3+2)=I%:ENDPROC
3750DEFPROCmode:PROCLX:PROCexp:PROCVDL(22):PROCVDU:ENDPROC
3760DEFPROCcolo:PROCLX:PROCexp:PROCVDL(17):PROCVDU:ENDPROC
3770DEFPROCgcol:PROCLX:PROCVDL(18):PROCexp:PROCVDU:PROCC(comma):PROCLX:PROCexp:PROCVDU:ENDPROC
3780DEFPROCplot:PROCLX:PROCVDL(25):PROCexp:PROCVDU:PROCC(comma):PROCLX:PROCexp:PROCVDD:PROCC(comma):PROCLX:PROCexp:PROCVDD:ENDPROC
3790DEFPROCmove:PROCLX:PROCVDL(25):PROCVDL(4):PROCexp:PROCVDD:PROCC(comma):PROCLX:PROCexp:PROCVDD:ENDPROC
3800DEFPROCdraw:PROCLX:PROCVDL(25):PROCVDL(5):PROCexp:PROCVDD:PROCC(comma):PROCLX:PROCexp:PROCVDD:ENDPROC
3810DEFPROCrep:LOCALLI%:PROCLX:LI%=P%
3820IFT%=eop ORT%=unt GOTO3840
3830PROCstate:IFT%=col ORT%=eoln PROCLX:GOTO3820
3840PROCC(unt):PROCLX:PROCexp
3850PROCJMC:PROCADR(P%-3,LI%):ENDPROC
3860DEFPROCLFIX(BX%)
3870LI%=VAL$$(BN%)
3880I%=0:REPEAT
3890IFLI%=L%?(4*I%)*256+L%?(4*I%+1):B%?(BX%+1)=L%?(4*I%+2):B%?(BX%+2)=L%?(4*I%+3):I%=NL%
3900I%=I%+1
3910UNTIL I%>=NL%
3920IFI%=NL% PROCEM(2)
3930ENDPROC
3940
3950DEFPROCIFIX(BX%)
3960IFLEN$$(BN%)=2:IFRIGHT$($$(BN%),1)="%":I%=ASCLEFT$($$(BN%),1):IF I%>64ANDI%<91:I%=(I%-65)*4+&404:B%?(BX%+1)=I% DIV256:B%?(BX%+2)=I% MOD256:ENDPROC
3970B%?(BX%+1)=P% DIV256:B%?(BX%+2)=P% MOD256:P%=P
:ENDPROC
3980DEFPROCAFIX(BX%)
3990IFB%?(BX%+1)=0 PROCEM(9)
4000B%?(BX%+1)=P% DIV256:B%?(BX%+2)=P% MOD256:P%=P
:ENDPROC
4010DEFPROCPFIX(BX%):IFB%?(BX%+1)=0 PROCEM(3)
4020ENDPROC
4030DEFPROCFFIX(BX%):IFB%?(BX%+1)=0 PROCEM(3)
4040ENDPROC
4050DEFPROCFIX
4060PRINT''"FIX UP STAGE"
4070EX%=P%:BN%=0:REPEAT
4080IFB%?(3*BN%)=lino:PROCLFIX(3*BN%)
4090IFB%?(3*BN%)=id PROCIFIX(3*BN%) ELSEIFB%?(3*BN%)=ar PROCAFIX(3*BN%)
4100IFB%?(3*BN%)=proc:PROCPFIX(3*BN%)
4110IFB%?(3*BN%)=fn:PROCFFIX(3*BN%)
4120BN%=BN%+1:UNTIL$$(BN%)=""
4130P%=P%:C%!-4=(P%+RL%)+&10000*E%+RL%
4140P%=C%:REPEAT:I%=?P%:IFI%=40P%=P%+1
4150IF(I%<64ORI%>100) P%=P%+1:GOTO4210 ELSEP%=P%+3
4160IFI%=74GOTO4210
4170IFI%=90 ORI%=92:P%=P%+(P%?-2)-1:GOTO4210
4180IFP%?-1<>0 GOTO4200
4190N%=P%?-2:P%?-1=B%?(N%*3+1):P%?-2=B%?(N%*3+2)
4200PROCRL
4210UNTIL P%>=E%
4220PRINT''"FIX UP NOW COMPLETE"
4230ENDPROC
4240DEFPROCRL
4250N%=256*P%?-1+P%?-2
4260IFN%<&E00 ENDPROC ELSEN%=N%+RL%
4270P%?-1=N%DIV256:P%?-2=N%MOD256
4280ENDPROC
4290
4300DEFPROCADD:PROCPP(1,2):ENDPROC
4310DEFPROCSUB:PROCPP(1,4):ENDPROC
4320DEFPROCMUL:PROCPP(1,6):ENDPROC
4330DEFPROCDIV:PROCPP(1,8):ENDPROC
4340DEFPROCGTT:PROCPP(1,10):ENDPROC
4350DEFPROCLTT:PROCPP(1,12):ENDPROC
4360DEFPROCGEQ:PROCPP(1,14):ENDPROC
4370DEFPROCLEQ:PROCPP(1,16):ENDPROC
4380DEFPROCEQU:PROCPP(1,18):ENDPROC
4390DEFPROCNEQ:PROCPP(1,20):ENDPROC
4400DEFPROCNEG:PROCPP(1,22):ENDPROC
4410DEFPROCVDU:PROCPP(1,24):ENDPROC
4420DEFPROCINK:PROCPP(1,26):ENDPROC
4430DEFPROCRTS:PROCPP(1,28):ENDPROC
4440DEFPROCLDI:PROCPP(1,30):ENDPROC
4450DEFPROCSTI:PROCPP(1,32):ENDPROC
4460DEFPROCEND:PROCPP(1,34):ENDPROC
4470DEFPROCPRI:PROCPP(1,36):ENDPROC
4480DEFPROCMOD:PROCPP(1,44):ENDPROC
4490DEFPROCVDD:PROCPP(1,46):ENDPROC
4500DEFPROCPP(B%,C%)
4510IFFNC(B%) ?P%=C%:P%=P%+B%
4520ENDPROC
4530DEFPROCVDL(L%):IFFNC(3):?P%=48:P%?1=L%:P%=P%+2
4540ENDPROC
4550DEFPROCSND:PROCPP(1,50):ENDPROC
4560DEFPROCLDT:PROCPP(1,52):ENDPROC
4570DEFPROCSTT:PROCPP(1,54):ENDPROC
4580DEFPROCAND:PROCPP(1,56):ENDPROC
4590DEFPROCORA:PROCPP(1,58):ENDPROC
4600DEFPROCEOR:PROCPP(1,60):ENDPROC
4610DEFPROCRND:PROCPP(1,62):ENDPROC
4620DEFPROCJMP:PROCPP(3,64):ENDPROC
4630DEFPROCJSR:PROCPP(3,66):ENDPROC
4640DEFPROCJMC:PROCPP(3,68):ENDPROC
4650DEFPROCLDA:PROCPP(3,70):ENDPROC
4660DEFPROCSTA:PROCPP(3,72):ENDPROC
4670DEFPROCFIR:PROCPP(3,76):ENDPROC
4680DEFPROCLDM:PROCPP(3,80):ENDPROC
4690DEFPROCSTM:PROCPP(3,82):ENDPROC
4700DEFPROCDMM:PROCPP(3,84):ENDPROC
4710DEFPROCDMA:PROCPP(3,86):ENDPROC
4720DEFPROCLDL(L%)
4730IFFNC(3) ?P%=74:P%?1=L%MOD256:P%?2=L%DIV256:P%=P%+3
4740ENDPROC
4750DEFPROCVDS
4760IFFNC(2+LEN$$) ?P%=90:P%?1=LEN$$:$(P%+2)=$$:P%=P%+2+LEN$$
4770ENDPROC
4780DEFPROCCLI
4790IFFNC(2+LEN$$) ?P%=92:P%?1=LEN$$:$(P%+2)=$$:P%=P%+2+LEN$$
4800ENDPROC
4810DEFPROCSQR:PROCPP(1,102):ENDPROC
4820DEFPROCSGN:PROCPP(1,104):ENDPROC
4830DEFPROCABS:PROCPP(1,106):ENDPROC
4840DEFPROCGET:PROCPP(1,108):ENDPROC
4850DEFPROCADV:PROCPP(1,110):ENDPROC
4860DEFPROCPOS:PROCPP(1,112):ENDPROC
4870DEFPROCVPO:PROCPP(1,114):ENDPROC
4880DEFPROCPOI:PROCPP(1,116):ENDPROC
4890DEFPROCCAL:PROCPP(1,118):ENDPROC
4900DEFPROCNOT:PROCPP(1,120):ENDPROC
4910DEFPROCENV:PROCPP(1,122):ENDPROC
4920DEFPROCRTF:PROCPP(1,126):ENDPROC
4930DEFPROCNXT:PROCPP(1,132):ENDPROC
4940DEFPROCADR(P%,A%)
4950IFP%<C% OR P%+2>E% ENDPROC
4960P%?2=A%DIV256
4970P%?1=A%MOD256
4980ENDPROC
4990
5000DEFFNC(B%)
5010IFP%+B%>=E% EN%=EN%+1:E%=E%-B%:=FALSE ELSE:=TRUE
5020DEFPROCERT:PRINT"<RETURN> TO CONTINUE ";:REPEAT UNTIL INKEY-74:PRINT:ENDPROC
5030DEFPROCEM(I%)
5040EN%=EN%+1
5050IFI%=1 PRINT''"missing """
5060IFI%=2 PRINT''"no such line number "+$$(BN%)
5070IFI%=3 PRINT''"no such fn/proc "+$$(BN%)
5080IFI%=4 PRINT''"too many variables"
5090IFI%=5 PRINT''"program needs ";ML%;" lines"
5100IFI%=6 PRINT''"program needs ";2*MC%+C%-E%;" bytes"
5110IFI%=7 PRINT''"syntax error !"
5120IFI%=8 PRINT''"array already dim'd"
5130IFI%=9 PRINT''"array "+$$(BN%)+" not dim'd"
5140PROCERT:ENDPROC
5150DEFPROCC(D%)
5160IF EL% ENDPROC
5170IF T%=D% ENDPROC
5180PRINT''"missing ";
5190EL%=T%:T%=A%:A%=D%
5200IFA%>32 ANDA%<>lino THEN CALL TK ELSEIFA%=id PRINT"id / variable";ELSEIFA%=ar PRINT"array dim"; ELSEIFA%=1 PRINT"expression"; ELSEIFA%=lino PRINT"line number";
5210A%=T%:EN%=EN%+1:PRINT:T%=0:PROCERT:ENDPROC
5220DEFPROCELP
5230IFEL%=eoln OR EL%=eop T%=EL%:EL%=FALSE:ENDPROC
5240EL%=FALSE:REPEAT PROCLX:UNTIL T%=eoln ORT%=eop
5250ENDPROC
5260DEFPROCEE
5270PRINT''";EN%;" ERRORS - COMPILATION STOPPED"
5280ENDPROC
5290DEFPROCNE
5300PRINT''"COMPILATION COMPLETE"
5310ENDPROC
5320DEFPROCT
5330FORI%=0TO23
5340VDU29+(I%/2)MOD5,157,141,135
5350PRINT"<<<  T.C.  BASIC  COMPILER  >>>"
5360NEXT:I%=INKEY150:CLS
5370ENDPROC
```


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Hex loader.

```
100 MODE 4
110 BORDER 5,0,6:CLS
120 PRINT"Type in starting address (followed
     by an 'h' if in hex)"
130 INPUT a$
140 IF a$(LEN(a$) TO LEN(a$))="h" THEN
150  a$=a$(1 TO LEN(a$)-1)
160  hex_dec a$
170 ELSE
180  t=a$
190 END IF
200 add=t
210 REPeat loader
220  CLS
230  FOR col=0 TO 18
240   AT col,0
250   dec_hex add,5
260   PRINT d$;"      ";
270   FOR q=0 TO 1
280    dec_hex PEEK(add+q),2
290    PRINT d$;
300   END FOR q
310   AT col,18
320   INPUT"?";b$
330   IF b$="" THEN GO TO 390
340   hex_dec b$
350   POKE_W add,t
360   AT col,18
370   dec_hex t,4
380   UNDER 1:PRINT d$;:UNDER 0:PRINT"    ";
390   add=add+2
400  END FOR col
410 END REPeat loader
420 DEFine PROCedure hex_dec(h$)
430  LOCal 1,a$,v
440  v=0:t=0
450  FOR 1=0 TO LEN(h$)-1
460   a$=h$(LEN(h$)-1 TO LEN(h$)-1)
470   IF CODE(a$)>57 THEN
480    v=CODE(a$)-87
490   ELSE
500    v=a$
510   END IF
520   t=t+v*16^1
530  END FOR 1
540 END DEFine
550 DEFine PROCedure dec_hex(v,1)
560  LOCal c,a$,b
570  b=v:d$=""
580  a$=b:a$=a$(1 TO 1)
590  b=ABS(b)
600  REPeat work
610   c=(b/16-INT(b/16))*16
620   IF c<=9 THEN
630    d$=CHR$(c+48)&d$
640   ELSE
650    d$=CHR$(c+55)&d$
660   END IF
670   b=INT(b/16)
680   IF b=0 THEN EXIT work
690  END REPeat work
700  d$=FILL$("0",1-LEN(d$))&d$
710  IF a$="-"THEN d$=a$&d$
720 END DEFine
```

ZOOM

Carsten Greve makes the QL screen bigger.

Explaining Zoom.

8 – 15	QDOS Trap routines.
18-24	Take 8192 bytes from the common heaproom. If not succeeded kill Zoom and return to Superbasic.
26-37	Open a console and set the cursor. If not succeeded kill Zoom and return to Superbasic.
38-44	Find out display mode and store it for later use.
46-62	Get a number from keyboard and jump to an Area.
64-101	Fill Heap_Room with the right area of screen.
103-140	Take Heap_Room and enlarge to the whole screen.
142-146	Kill Zoom and return to Superbasic.
148-182	Data definition for console and Bit_Data.

ZOOM IS a graphics utility for the QL which enlarges part of the screen in Mode 4 or Mode 8. It allows you to double one of the four screen quadrants simply by pressing a key. Once you have zoomed you can zoom again, and again . . . until the screen either fills up or becomes empty.

If you have an assembler you can enter the assembler code directly. You must remember that it has to produce an executive code — that is a position independent code.

If you have not got an assembler you can use the Basic hex-loader listed elsewhere or use your own program to enter the assembled code — this is much faster than using an assembler but errors arise more often.

If you use the Basic hex-loader type the program in and save it for later use. Make room in memory for the machine code by typing

OP = RESPR (512)

See what starting address you have got for the code by typing

PRINT OP

Run the hex-loader and type in the address. Remember that you must type in the code as words, so if the listing says:

0000' 223C 0000 2000 23
MOVE.L #HEAP_ROOM,D1

(continued on page 101)

Assembly listing.

```
 LOC      OBJECT          STMT        SOURCE STATEMENT

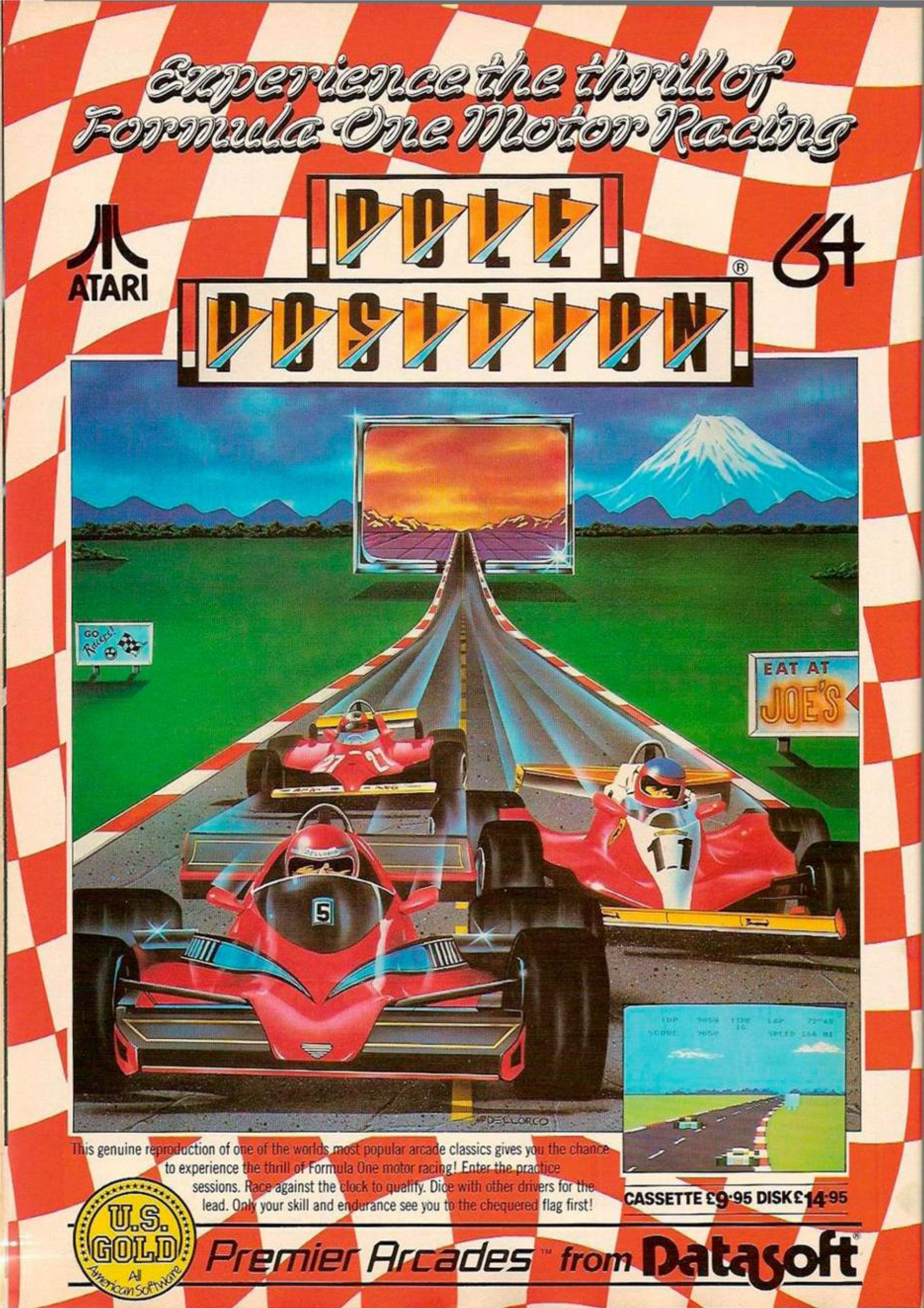
                            1 * ZOOM
                            2 * A procedure to enlarge part of the screen
                            3 * By Carsten Greve
                            4 * Started on the 14th of December 1984
                            5 * Finished on the 22nd of December 1984
                            6 * For the SINCLAIR QL version JM
                            7
      =2000                 8 HEAP_ROOM EQU     8192
      =0018                 9 MT_ALCHP  EQU     24
      =0001                10 IO_OPEN   EQU     1
      =000E                11 SD_CURE   EQU     14
      =0001                12 IO_FBYTE  EQU     1
      =00CA                13 UT_ERRO   EQU     202
      =0005                14 MT_FRJOB  EQU     5
      =0010                15 MT_DMODE  EQU     16
                           16
0000'                      17 START
0000'  223C 0000 2000      18           MOVE.L  #HEAP_ROOM,D1
0006'  74FF                19           MOVEQ   #-1,D2
0008'  7018                20           MOVEQ   #MT_ALCHP,D0
000A'  4E41                21           TRAP    #1
000C'  4A80                22           TST.L   D0
000E'  6600 0158           23           BNE     JOB_END
0012'  2A48                24           MOVE.L  A0,A5
                           25
0014'  72FF                26           MOVEQ   #-1,D1
0016'  7602                27           MOVEQ   #2,D3
0018'  41FA 015A           28           LEA.L   DEVNAME,A0
001C'  7001                29           MOVEQ   #IO_OPEN,D0
001E'  4E42                30           TRAP    #2
0020'  4A80                31           TST.L   D0
0022'  6600 0144           32           BNE     JOB_END
0026'  76FF                33           MOVEQ   #-1,D3
0028'  700E                34           MOVEQ   #SD_CURE,D0
002A'  4E43                35           TRAP    #3
002C'  4A80                36           TST.L   D0
002E'  6600 0138           37           BNE     JOB_END
                           38
0032'  72FF                39           MOVEQ   #-1,D1
0034'  74FF                40           MOVEQ   #-1,D2
0036'  7010                41           MOVEQ   #MT_DMODE,D0
0038'  4E41                42           TRAP    #1
003A'  E309                43           LSL.B   #1,D1
003C'  1801                44           MOVE.B  D1,D4
                           45
003E'  284D                46 LOOP_0    MOVE.L  A5,A4
0040'  76FF                47           MOVEQ   #-1,D3
0042'  7001                48           MOVEQ   #IO_FBYTE,D0
0044'  4E43                49           TRAP    #3
0046'  4A80                50           TST.L   D0
```

(listing continued on page 101)









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(listing continued from page 99)

```
0048'  6600 011E          51            BNE       JOB_END
004C'  B23C 0031          52            CMP.B     #$31,D1
0050'  671C               53            BEQ.S     AREA_1
0052'  B23C 0032          54            CMP.B     #$32,D1
0056'  6736               55            BEQ.S     AREA_2
0058'  B23C 0033          56            CMP.B     #$33,D1
005C'  6750               57            BEQ.S     AREA_3
005E'  B23C 0034          58            CMP.B     #$34,D1
0062'  676A               59            BEQ.S     AREA_4
0064'  B23C 000A          60            CMP.B     #$0A,D1
0068'  6700 0104          61            BEQ       END_JOB
006C'  60D0               62            BRA.S     LOOP_0
                          63
006E'  227C 0002 0000     64 AREA_1     MOVE.L    #$20000,A1
0074'  28D9               65 LOOP_1     MOVE.L    (A1)+,(A4)+
0076'  2209               66            MOVE.L    A1,D1
0078'  0801 0006          67            BTST      #6,D1
007C'  67F6               68            BEQ.S     LOOP_1
007E'  D3FC 0000 0040     69            ADDA.L    #$40,A1
0084'  B3FC 0002 4000     70            CMPA.L    #$24000,A1
008A'  66E8               71            BNE.S     LOOP_1
008C'  605E               72            BRA.S     FILL_SCR
                          73
008E'  227C 0002 0040     74 AREA_2     MOVE.L    #$20040,A1
0094'  28D9               75 LOOP_2     MOVE.L    (A1)+,(A4)+
0096'  2209               76            MOVE.L    A1,D1
0098'  0801 0006          77            BTST      #6,D1
009C'  66F6               78            BNE.S     LOOP_2
009E'  D3FC 0000 0040     79            ADDA.L    #$40,A1
00A4'  B3FC 0002 4040     80            CMPA.L    #$24040,A1
00AA'  66E8               81            BNE.S     LOOP_2
00AC'  603E               82            BRA.S     FILL_SCR
                          83
00AE'  227C 0002 4000     84 AREA_3     MOVE.L    #$24000,A1
00B4'  28D9               85 LOOP_3     MOVE.L    (A1)+,(A4)+
00B6'  2209               86            MOVE.L    A1,D1
00B8'  0801 0006          87            BTST      #6,D1
00BC'  67F6               88            BEQ.S     LOOP_3
00BE'  D3FC 0000 0040     89            ADDA.L    #$40,A1
00C4'  B3FC 0002 8000     90            CMPA.L    #$28000,A1
00CA'  66E8               91            BNE.S     LOOP_3
00CC'  601E               92            BRA.S     FILL_SCR
                          93
00CE'  227C 0002 4040     94 AREA_4     MOVE.L    #$24040,A1
00D4'  28D9               95 LOOP_4     MOVE.L    (A1)+,(A4)+
00D6'  2209               96            MOVE.L    A1,D1
00D8'  0801 0006          97            BTST      #6,D1
00DC'  66F6               98            BNE.S     LOOP_4
00DE'  D3FC 0000 0040     99            ADDA.L    #$40,A1
00E4'  B3FC 0002 8040    100            CMPA.L    #$28040,A1
00EA'  66E8              101            BNE.S     LOOP_4
                         102
00EC'  284D              103 FILL_SCR   MOVE.L    A5,A4
00EE'  227C 0002 0000    104            MOVEA.L   #$20000,A1
00F4'  1214              105 LOOP_FS    MOVE.B    (A4),D1
00F6'  E809              106            LSR.B     #4,D1
00F8'  C27C 000F         107            AND.W     #$F,D1
00FC'  D204              108            ADD.B     D4,D1
00FE'  45FA 007A         109            LEA.L     BIT_DATA,A2
0102'  1432 1000         110            MOVE.B    0(A2,D1.W),D2
0106'  1342 0080         111            MOVE.B    D2,$80(A1)
010A'  12C2              112            MOVE.B    D2,(A1)+
010C'  121C              113            MOVE.B    (A4)+,D1
010E'  C27C 000F         114            AND.W     #$F,D1
0112'  D204              115            ADD.B     D4,D1
0114'  1432 1000         116            MOVE.B    0(A2,D1.W),D2
0118'  1342 0081         117            MOVE.B    D2,$81(A1)
011C'  1342 0001         118            MOVE.B    D2,1(A1)
0120'  1214              119            MOVE.B    (A4),D1
0122'  E809              120            LSR.B     #4,D1
0124'  C27C 000F         121            AND.W     #$F,D1
0128'  D204              122            ADD.B     D4,D1
[illegible]  45FA 004E   123            LEA.L     BIT_DATA,A2
012E'  1432 1000         124            MOVE.B    0(A2,D1.W),D2
0132'  1342 0080         125            MOVE.B    D2,$80(A1)
0136'  1282              126            MOVE.B    D2,(A1)
0138'  121C              127            MOVE.B    (A4)+,D1
013A'  C27C 000F         128            AND.W     #$F,D1
013E'  D204              129            ADD.B     D4,D1
0140'  1432 1000         130            MOVE.B    0(A2,D1.W),D2
0144'  1342 0082         131            MOVE.B    D2,$82(A1)
0148'  1342 0002         132            MOVE.B    D2,2(A1)
014C'  5689              133            ADDQ.L    #3,A1
014E'  3209              134            MOVE.W    A1,D1
0150'  0801 0007         135            BTST      #7,D1
0154'  679E              136            BEQ.S     LOOP_FS
0156'  D3FC 0000 0080    137            ADDA.L    #$80,A1
015C'  B3FC 0002 8000    138            CMPA.L    #$28000,A1
0162'  6690              139            BNE.S     LOOP_FS
0164'  6000 FED8         140            BRA       LOOP_0
                         141
0168'  3478 00CA         142 JOB_END    MOVE.W    UT_ERRO,A2
016C'  4E92              143            JSR       (A2)
016E'  7005              144 END_JOB    MOVEQ     #MT_FRJOB,D0
0170'  72FF              145            MOVEQ     #-1,D1
0172'  4E41              146            TRAP      #1
                         147
0174'  0004              148 DEVNAME    DC.W      4
0176'  434F 4E5F         149            DC.B      'CON_'
                         150            These are for MODE 4
017A'  00                151 BIT_DATA   DC.B      %00000000
017B'  03                152            DC.B      %00000011
017C'  0C                153            DC.B      %00001100
017D'  0F                154            DC.B      %00001111
017E'  30                155            DC.B      %00110000
017F'  33                156            DC.B      %00110011
0180'  3C                157            DC.B      %00111100
0181'  3F                158            DC.B      %00111111
0182'  C0                159            DC.B      %11000000
0183'  C3                160            DC.B      %11000011
0184'  CC                161            DC.B      %11001100
0185'  CF                162            DC.B      %11001111
0186'  F0                163            DC.B      %11110000
0187'  F3                164            DC.B      %11110011
0188'  FC                165            DC.B      %11111100

                                        These are for MODE 8
0189'  FF                166            DC.B      %11111111
018A'  00                167            DC.B      %00000000
018B'  05                168            DC.B      %00000101
018C'  0A                169            DC.B      %00001010
018D'  0F                170            DC.B      %00001111
018E'  50                171            DC.B      %01010000
018F'  55                172            DC.B      %01010101
0190'  5A                173            DC.B      %01011010
0191'  5F                174            DC.B      %01011111
0192'  A0                175            DC.B      %10100000
0193'  A5                176            DC.B      %10100101
0194'  AA                177            DC.B      %10101010
0195'  AF                178            DC.B      %10101111
0196'  F0                179            DC.B      %11110000
0197'  F5                180            DC.B      %11110101
0198'  FA                181            DC.B      %11111010
0199'  FF                182            DC.B      %11111111
                         183
                         184            END
```

(continued from page 99)

you must type 223C and Enter, 0000 and Enter, 2000 and Enter.

If the listing says:

0190' 5A 173 DC.B %01011010
0191' 5F 174 DC.B %01011111

you must type 5A5F and Enter.

When you have finished typing in press Ctrl-space. To check the code you must Run the hex-loader again with the same starting address. If the code is correct just type Enter, and if the code is incorrect type the correct code in and continue.

If you have used an assembler, the assembler should have produced an Executable code. If you have used the hex-loader you must type:

SEXEC mdv1_ZOOM,OP,412,64

Therre are two different ways of running the Zoom-code and I will describe both here.

EXEC_W MDV1_ZOOM = With this command you run the code and you cn make as many Zoom's as you like, and when you have finished you type Enter to return to Superbasic.

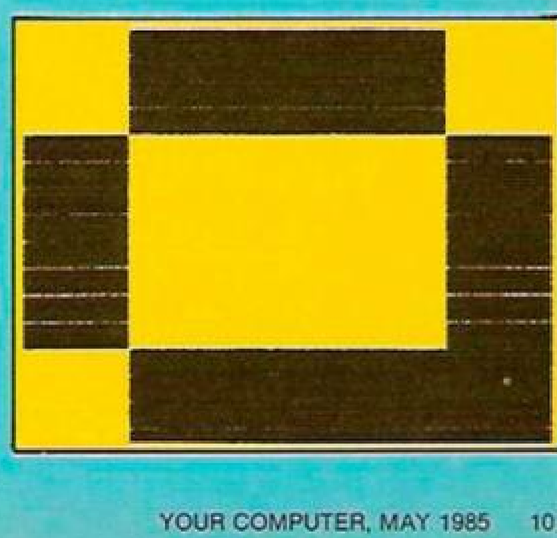
EXECMDV1_ZOOM = With this command you also run the code, but you stay in Superbasic. To make a Zoom you must type Ctrl C to transfer control to the Zoom-procedure. Now you can again make as many Zoom's as you like, but to go back to Superbasic you just have to type Ctrl C. In this way you can use the Zoom-procedure on many screens.

The screen is organised in the following way and you just have to type one of the numbers to obtain a Zooming.

1	2
3	4







PLOTLINE

Mark Jones with a set of programs which show how difficult it is to manipulate screen memory and the ease of using the Call command.

THE FOLLOWING machine-code routines for the QL were written as an exercise in 68008 programming. They demonstrate the difficulties involved in manipulating the screen memory and also show the ease with which data can be passed to machine code from Basic using the Call command.

To set up the code, run the Basic code creator program. Whenever you reset the computer you will need to reserve some memory for the routines by typing

BOX = RESPR (250)

Now load the code with

LBYTES MDV1—CODE,BOX

The variable Box contains the address at which the code is stored. To plot a point Call ST, x co-ordinate, y co-ordinate, colour. To draw a box Call ST+2, x co-ordinate of bottom left corner, y co-ordinate of bottom left corner, width of box, depth, thickness of box.

For example, to draw a box at 100,000, width = 10, depth = 10, thickness 3, colour red — in mode 4:

CALL BOX + 2, 100,100,2,10,10,3

For further information see under Call in the QL manual.

The x and y co-ordinates are independent of channels and scale where x = 0, y = 0 is the top left corner of the screen, x = 512 (26 if mode 8), y = 256 is the bottom right corner. Colour codes for the routine are explained in the assembler listing.

Speeds achieved for the plot routine are faster than the QL's own plot routine and this speed advantage is particularly effective in machine code. Using a plot routine is not the fastest way to draw a box but again serves as a useful demonstration of 68008 machine code.



Demo program.

```
1 REMark **** BASIC DEMONSTRATION PROGRAM ****
3 OPEN #4,scr_512x256a0x0:CLS #4
4 FOR h=0 TO 250 STEP 40
5  g=1:j=1
9 FOR m=1 TO 11
10 FOR f=1 TO 50
11 k=f:IF g:k=4%
20 CALL box+2,j,k+h,f,10-f/10,10-f/10,1
21 j=j+1
30 NEXT f
40 g=1-g
50 NEXT m
60 FOR f=1 TO 512 STEP 5:CALL box+2,f,h,f,10,10,4
70 NEXT h
80 FOR f=1 TO 32:PAN #4,16
90 GO TO 4
100 box=RESPR(240):LBYTES mdv1_code,box:RUN
999 MODE 4:PRINT "Loading Basic Demonstration"
1000 MERGE mdv1_basic_demo:GO TO 100
```

Code loader.

```
1 st=RESPR(500)
2 REMark
10 DATA 96,22,85,10,101,236,62,65,255,4,81,4,97,250,82
,207,72,2,100,134,0,41,103,255,0,65,0,3,0,34,104,76,22
7,60,0,3,239,2,2,196,96,14,255,0,203,41,0
15 REMark
20 DATA 70,82,68,83,4,78,4,97,250,83,207,96,18,62,66,2
55,167,2,66,56,2,0,34,104,100,0,254,20,1,2,65,2,73,0,1
5,0,74,0,60,112,6,227,240,135,41,0,126
25 REMark
30 DATA 96,65,105,69,81,117,96,42,62,66,255,4,81,5,97,
250,126,66,102,1,130,0,2,65,220,7,2,3,226,65,102,65,82
,252,20,3,34,0,1,7,227,29,203,41,0,1,112
35 REMark
40 DATA 10,83,12,103,206,66,4,81,5,97,250,83,207,96,6,
70,0,0,0,34,52,0,65,102,76,50,3,2,14,0,74,0,65,190,3,2
20,124,210,254,144,11,81,41,0,1,76,0
45 REMark
50 DATA 97,66,101,6,255,135,82,207,96,30,62,65,255,4,0
1,117,60,255,0,124,12,0,1,0,2,60,0,3,96,255,226,3,26,6
0,2,14,0,194,210,1,227,208,0,0,141,159,70
51 DATA 117
55 REMark
70 RESTORE
80 tot=0
90 FOR g=0 TO 4
100 FOR f=0 TO 46
110 READ d:POKE st+g*f*5,d
115 tot=tot+d
120 NEXT f
130 NEXT g
140 READ d:POKE st+235,d
145 tot=tot+d
146 IF tot<>10982 THEN PRINT "error"
147 PRINT "code stored ok from ";st;" length 236 bytes
"
150 STOP
```

Assembly listing.

```
MODE     EQU   163892
SCREEN   EQU   131072
*
*
PLIN  BRA.S  PLOT      ENTER HERE FROM BASIC TO PLOT ONLY
BXIN  BRA.S  MULTI     ENTER HERE FROM BASIC TO DRAW BOX (PLIN +2)
*****************************************************************************
*  MULTI THICNESS BOX ROUTINE                                               *
*      D6=THICKNESS OF BOX, WIDTH AND DEPTH ARE EXTERNAL MEASUREMENTS       *
*      OTHER ENTRY PARAMETERS AS FOR BOX ROUTINE                            *
*                                                                           *
*****************************************************************************
LOOP  BSR.S     BOX
      ADDQ      #1,D1       NEXT BOX LH CORNER IS X=X+1
      SUBQ      #1,D2       Y=Y-1
      SUBQ      #2,D4       WIDTH=WIDTH-2
      BEQ.S     EXIT        EXIT LOOP IF WIDTH=0
      BCS.S     EXIT        EXIT LOOP IF WIDTH<0
      SUBQ      #2,D5       DEPTH=DEPTH-2
      BEQ.S     EXIT        EXIT LOOP IF DEPTH=0
      BCS.S     EXIT        EXIT LOOP IF DEPTH<0
MULTI DBRA      D6,LOOP     DRAW (D6) BOXES. ENTER ROUTINE HERE FROM BOX_ENT
EXIT  RTS
*****************************************************************************
*   BOX ROUTINE        D1=X, D2=Y, D3=COL, D4=WIDTH, D5=DEPTH               *
*                                                                           *
*          ALL REGISTERS UNCHANGED EXCEPT   A1=ADDRESS OF LH CORNER, D7=-1  *
*                                                                           *
* MODE 4 COLS  0=BLACK,1=GREEN,2=RED,3=WHITE                                *
* MODE 8 COLS  0=BLACK,2=GREEN,4=BLUE,6=CYAN,8=RED,10=YELLOW,12=MAGENTA     *
*              14=WHITE,ADD 1 TO MODE 8 COLOUR FOR FLASH                    *
*****************************************************************************
BOX    CLR.L    D7
       MOVE.W   D4,D7
       BRA.S    BOXA         TOP OF BOX
BOXAA  ADDQ     #1,D1
       BSR.S    PLOT
BOXA   DBRA     D7,BOXAA
*
       MOVE.W   D5,D7
       BRA.S    BOXB
BOXBB  SUBQ     #1,D2        RIGHTHAND SIDE
       BSR.S    PLOT
BOXB   DBRA     D7,BOXBB
*
       MOVE.W   D4,D7
       BRA.S    BOXC
BOXCC  SUBQ     #1,D1        BOTTOM OF BOX
       BSR.S    PLOT
BOXC   DBRA     D7,BOXCC
*
       MOVE.W   D5,D7
       BRA.S    BOXD
BOXDD  ADDQ     #1,D2        LEFTHAND SIDE
       BSR.S    PLOT
BOXD   DBRA     D7,BOXDD     X1 AND X2 ARE NOW BACK TO ORIGINAL VALUES
       RTS
*****************************************************************************
* PLOT ROUTINE   D1=X D2=Y D3=COLOUR(0-15)                                  *
*              SPEED=110 PLOTS/SEC FROM BASIC - 3000 PLOTS/SEC FROM M/C     *
*                    QL POINT ROUTINE=40 PLOTS/SEC                          *
*       ALL REGISTERS UNCHANGED EXCEPT D0=0,A1(LEFT WITH SCREEN ADDRESS)    *
*                                                                           *
*****************************************************************************
PLOT   MOVEM.W  D1-D6,-(A7)        SAVE REGISTERS
       MOVE.W   D2,D6              COPY Y
       ANDI.W   #255,D2
       CMP.W    D2,D6              Y OUT OF RANGE ?
       BNE      RANGX
       MOVE.W   D1,D4              COPY X
       MOVE.L   #MODE,A1           MODE STORAGE AREA
       CMPI.B   #8,0(A1)           MODE 8 ?
       BEQ.S    MODE8              YES..
*
*      EITHER MODE 8 OR MODE 4 ROUTINE USED HERE
*
MODE4  ANDI.W   #511,D1            0<X<512
       CMP.W    D1,D4              X OUT OF RANGE ?
       BNE      RANGX
       LSR.W    #2,D4              X2=X/4        USED FOR ADDRESS
       ANDI.W   #7,D1              X AND 7    * X3=X AND 7
       MOVE.W   #254,D5            MASK=11111110
       ANDI.B   #3,D3              COLOURS 0-3
       MOVE.B   D3,D6              COPY COLOUR
       ANDI.B   #1,D3              BOTTOM 1 BIT OF COLOUR BYTE 1
       LSR.B    #1,D6              TOP 1 BIT OF COLOUR BYTE 2
       BRA.S    ALLOK
*
*
*
MODE8  ANDI.W   #255,D1            0<X<256
       CMP.W    D1,D4              X OUT OF RANGE ?
       BNE.S    RANGX
       LSR.W    #1,D4              X2=X/2       USED FOR ADDRESS
       ANDI.W   #3,D1              X AND 3    *
       LSL.W    #1,D1              X*2        * X3=2*(X AND 3)+1
       ADDQ     #1,D1              X+1        *
       MOVE.B   #252,D5            MASK=11111100
       AND.B    #15,D3             COLOURS 0-15
       MOVE.B   D3,D6              COPY COLOUR
       ANDI.B   #3,D3              BOTTOM 2 BITS OF COLOUR BYTE1
       LSR.B    #2,D6              TOP 2 BITS OF COLOUR BYTE2
*
*      SCREEN ADDRESS= Y*128 + (IF MODE8 X/4 AND 510,IF MODE4 X/2 AND 510)
*      MODE 4 AND MODE 8 ROUTINES BOTH END UP HERE
*
ALLOK  LSL.W    #7,D2              Y2=Y*128
       MOVE.L   #SCREEN,A1         GET START OF SCREEN
       ADDA.W   D2,A1              ADDR=ADDR+Y2
       ANDI.W   #510,D4            LOSE ANY ODD 1
       ADDA.W   D4,A1              ADDR=ADDR+X2
*
*      A1 NOW CONTAINS CORRECT SCREEN ADDRESS
*
       MOVEQ    #7,D0
       SUB.B    D1,D0              7-X3    FIND WHICH BITS TO ALTER
       BRA.S    LPA
LPA1   LSL.B    #1,D3              ROTATE 1ST COLOUR BYTE
       LSL.B    #1,D6              ROTATE 2ND COLOUR BYTE
       ROL.B    #1,D5              ROTATE MASK OVER  E.G 11110011
LPA    DBRA     D0,LPA1
*
*      ACTUAL PLOT IS DONE HERE
*
       AND.B    D5,0(A1)           MASK OF SCREEN  (SET PLOT POS TO 00)
       OR.B     D3,0(A1)           OR 1ST BYTE WITH SCREEN
       AND.B    D5,1(A1)           MASK OF SCREEN
       OR.B     D6,1(A1)           OR 2ND BYTE WITH SCREEN
RANGX  MOVEM.W  (A7)+,D1-D6        RETRIEVE REGISTERS
       MOVEQ    #0,D0              ENSURE NO ERROR ON RETURN TO BASIC
       RTS
       END
```

CONNECT PROTECT

Peripherals make using your computer more interesting and easier. But you may have more items of equipment than power outlets. The best way of tidying up the trailing wires and obtaining a 'clean' power supply is to use STRIPBLOC. It has five CEE 22 outlets, probably more than enough for connecting your add-ons to your power source. It's rugged, made from tough black plastic, and safe, meeting British and European safety requirements. **The Stripbloc is RFI filtered against spikes, 'dirty' mains and 'unclean' power.** Once you've bought it you don't need any extras, it's supplied with five standard right-angled rewireable plugs, a 2m fully-approved cable and moulded 13A plug. Forget about risky connections. Be safe with STRIPBLOC.



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It could be caused by any number of things: a light switch, a fridge, a central heating motor starting, or even a thunderstorm. The power lines of your computer can pick up many forms of natural and man-made interference, which can be damaging to computers and peripherals. Rendar's SPIKEBLOC has been developed to give protection against transient over voltages and continuous high frequency interference on the mains supply. The unit is housed in a rugged metal case and gives good electrical screening from high frequency sources. This high level of protection was only possible previously using elaborate and expensive filter units. Now it isn't too expensive for you to protect your equipment.

Stripbloc includes: ■ 1 five outlet mains unit with RFT filter ■ 2m cable with moulded 13A mains plug ■ 5 rewireable right-angled plugs **Spikebloc includes:** ■ 1 mains protection unit with integral 13A mains socket ■ 2m cable with moulded 13A plug

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Durban Road, Bognor Regis PO22 9RL.

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Spikebloc		£49.99	
		TOTAL	

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Address ______
______ Post Code ______

I enclose cheque/postal order made payable to **Rendar Ltd.,**

for £ ______ or debit my Access/Visa Credit Card

No ______

(Prices includes VAT, Postage & Packing)

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DATAB

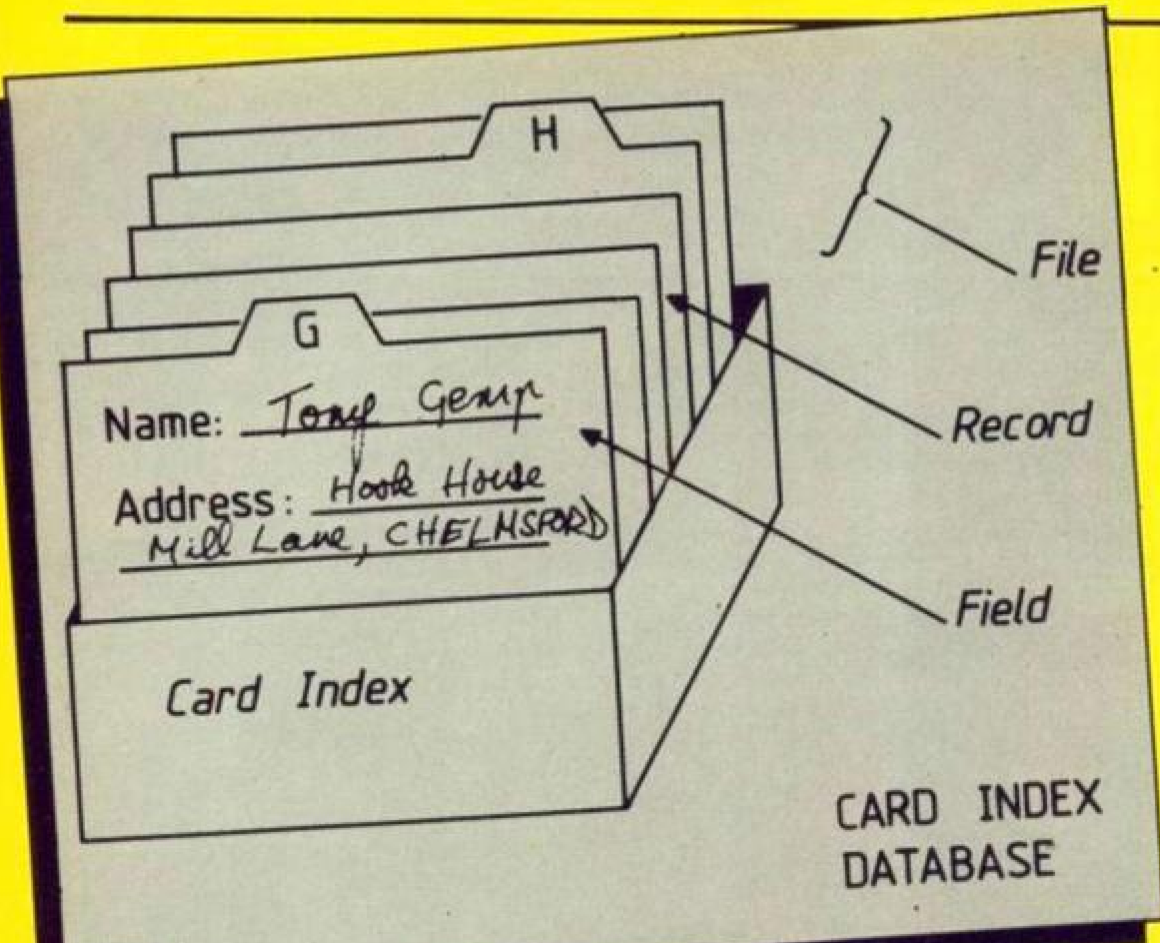


Figure 1.

THIS SERIES of articles is about four database programs for the BBC microcomputer. It is impossible to review these sophisticated programs adequately in a single article and I hope that some of the ideas and the solutions to problems will help you if you are thinking of buying a database program for *any* microcomputer, not just the BBC machine.

A microcomputer is a general-purpose machine that can be made to look like any other machine by programming it to simulate the actions of the machine. In other words, a microcomputer can simulate a numerically controlled machine tool, model a central heating system or act as a central heating system controller, edit and format text or work as a complex pocket calculator.

A microcomputer can be used to store, manipulate and retrieve information and a spreadsheet program like Viewsheet or Ultracalc 2, for example, establishes a sort of database except that it is dedicated to displaying information in a particular way. General-purpose programs for database manipulation make fewer assumptions about the type of data that will be held in the system and the ways in which it will be used for calculation and displayed.

The best known, and most widely sold, database for microcomputers is dBase II which is marketed by Ashton Tate, California. dBase II is written in machine code for the Z-80 central processor unit and will not run directly on the BBC microcomputer's 6502 CPU. However, the program has been installed on the Z-80 second processor for the BBC machine and is now available.

A difference with dBase II

dBase II is entirely different from all the other database programs that are on sale for the BBC micro because it is not a dedicated database program but a high level programming language. There are about 84 commands and functions in the dBase II language and these can be combined into command files that are interpreted by the central dBase II core.

A dBase II program can set up a database of information and can then sort, search, calculate results and output the results in a huge variety of different ways.

The four databases that are included are:

Datagem	Gemini Marketing Ltd., Exmouth. 0395 265165.
Scribe Database	Merlin Computer Products, Swansea. 0792 467980.
Stardatabase	GCC (Cambridge) Ltd., Cambridge. 0223 835330.
Database	Acornsoft Ltd., Cambridge. 0223 316039.

All of these programs are dedicated in the sense that the structure of the information in the database is largely preordained. That seems to contradict some of the advertising claims made for Datagem and Stardatabase so let's see what's going on in more detail.

Figure 1 shows the card index architecture that is used by all four programs. A single file of information is held on a floppy disc and this can be accessed by the program to give you the results that you want. In these programs a *file* looks like a box holding a number of cards. You may have a number of boxes holding cards on different subjects; a stamp collection, a name and address list, recipes for your kitchen and so on.

Each file consists of a number of *records* which you can think of as the individual cards in the card-index box. Each card has information written on it. If the information is organised in a regular way then each piece of information is a *field* in the record.

So, there are several fields in each record and a number of records make up a file. Figure 2 shows the record format for a hypothetical wine cellar file. There are eight fields in each record and the information recorded about each wine is of various types. The date the wine was brought into the cellar is structured information in the form DD/MM/YYYY — Day/Month/Year — while the name of the wine is a string of alphanumeric characters of indeterminate length.

Figure 2.

NAME: Corton-Charlemagne
VINTAGE: 1980
DATE BOUGHT: 25/05/1983
MERCHANT: S H Jones
TELEPHONE: 0295 11798
QUANTITY: 8 bottles
CURRENT STOCK: 3
TASTING NOTES: ______

Note particularly that the tasting notes field is longer than the width of the paper or the VDU screen; long fields create special problems for printing out information in three of the databases when you try to use them in conjunction with *View* or *Wordwise*.

Figure 3 shows the record format of a real name and address file. This record layout and the fields it contains are more complex than the usual, trivial examples shown in the instruction manuals because "real" life is both complex and messy.

However, in both figure 2 and figure 3 you can see at once that the same information is recorded in the same place on each card. In other words, the program can look in the same place on each record and expect to find a name, or the date you bought a stamp, or how much you paid for a consignment of wine, or simply the town in which someone lives.

BASES

In the first in a series of articles, John Dawson looks at databases in general and how they operate.

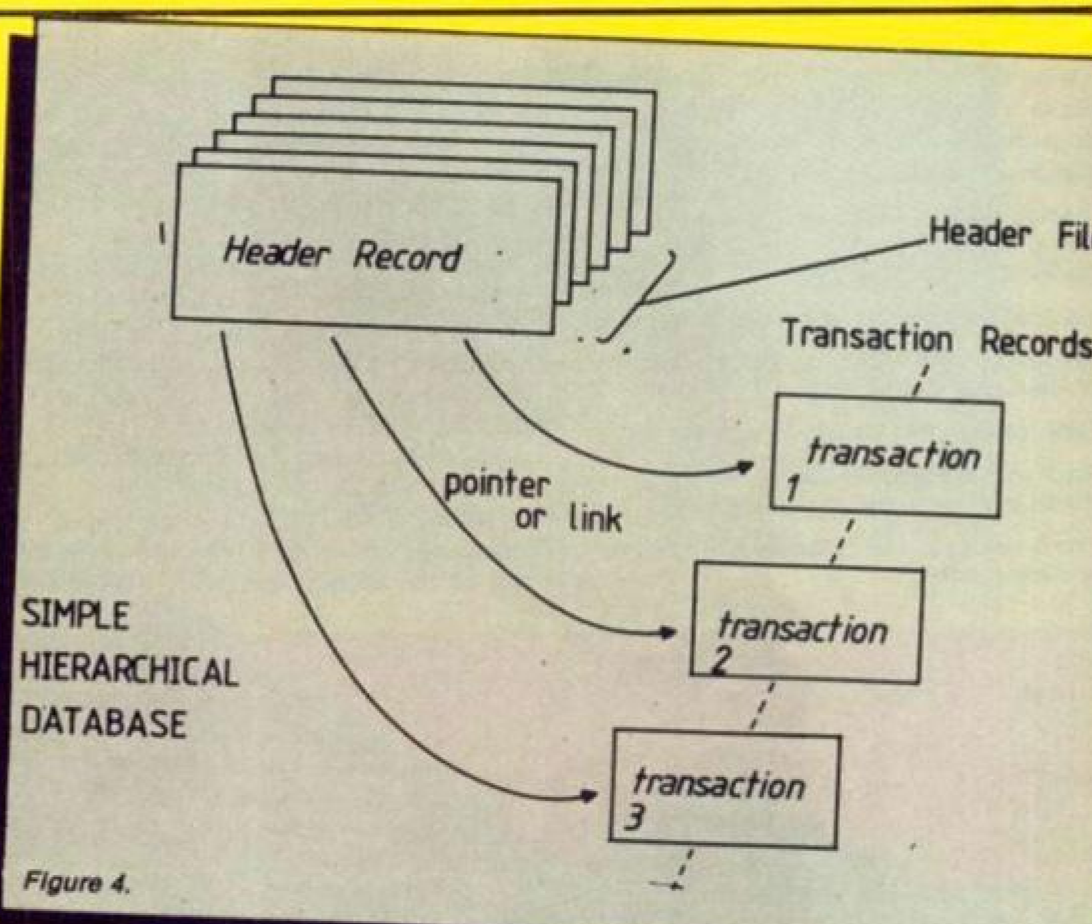


Figure 4.

Figure 3.

```
PEOPLE                          04/03/1985
FILE    LENGTH         625 records
FILE    USED           34 records
RECORD LENGTH          601 characters
*** FIELD NAME LIST ***

ONAME     S
ACTIVE    S
ADD1      S
ADD2      S
ADD3      S
CODE      S
FAMILY    S
FNAME     S
KEY1      S
NOTES     S
ORGN      S
P1        S
P2        S
P3        S
P4        S
PINDEX    S
TITLE     S
UPDATE    N
XMAS      S
XREF      S
XREF1     S
*** INPUT CARD ***

SURNAME
Firstname                Title
ORGANISATION
TELEPHONE

ADDRESS

KEYWORDS

A>........ Update         Christmas
Phone Index               Family
References
NOTES
```

A card index architecture is simple, straightforward and can be very useful for many purposes. For example, all other factors being equal, you could use any of the four programs for the following purposes:

Software catalogue
Photograph and slide indexing
Christmas card lists
Name and address files
Mailshot personalised mailings
Price lists
Estate agents' housing lists

There are, however, other ways of structuring information that are better suited to many common tasks that you may want to carry out.

Figure 4 illustrates the architecture of a very simple hierarchical database. Suppose that you want to set up an invoicing system for sales of mugs, plates, casserole dishes, parsley pots and other items from your craft pottery. If none of your customers ever buys from you more than once then the card index architecture is quite adequate.

Presumably, though, you would like some of your customers to come back again for more of your goods. When this happens you have to re-enter all the same details about the customer's name, invoice address, delivery address, telephone number each time you make a sale.

Apart from being very time consuming, the chances of errors occurring are large and if you make a mistake in entering the customer's name it becomes more and more difficult to relate one sale in June to another in October and two in the previous March. You can't run any sort of a credit system with the card index approach.

The database in figure 4 is different. When a customer first makes contact with your operation the name, addresses, telephone numbers and other information that you will need for the first, *and subsequent orders,* are typed into the database to form a header record. The goods that you supply, the cost per item, total price, Value Added Tax, discount and so on are entered into a separate transaction record which is linked to the header record by a pointer.

The information in the transaction record is different to that in the header record — the second field, for example, may contain a telephone number in the header record and a description of a piece of furniture in the transaction record; so you need two files, but the files are linked automatically by the database program.

When the customer, impressed by your efficiency, returns for the third time you can search through the header file to find the original entry and immediately enter information into a new transaction record for the next sale. In a well designed system it should be possible to merge information from the header record with the transaction record to print an invoice and label for the envelope. The transaction should point to the header, just as the header must point to all the transactions.

dBase II has an exceptionally advanced feature that permits you to work in two separate active areas at the same time: Primary and Secondary. You can switch between the two areas by typing Select Secondary followed by Use 'newfilename'. Return to the primary database is achieved by typing Select Primary.

Prefix the name of variable

Information can be transferred from one area to another by prefixing the name of a variable with either P. or S. This facility means that records in a second file can be found or manipulated by reference to records in the first file.

dBase II is an example of the third type of database which has been talked about greatly in the last few years. dBase II is a relational database. E.F. Codd published a fundamental paper titled 'A Relational Model of Data for Large Shared Databanks' in Communications ACM in June 1970.

Although the theory of relational databases

(continued on next page)

(continued from previous page)

can be taken into quite high powered mathematics, the ideas underlying it all are simply to do with tables. As Kenneth Robinson says in Database Analysis and Design:

"tables are a very simple and natural way of regarding data . . . The tables conform to a set of rules . . .

Each box in a table contains one value

Within a column the box values are all of the same kind

Each column has a distinct name

Each row is unique — there are no duplicates

The ordering of the columns and rows is not significant"

Figure 5 illustrates part of a simple medical relational database. The information in the database is arranged in tables and each part of the information relates to other parts. The patient's name is put together with the address and a registration number.

By looking down — searching — the name and address file it's possible to find a name by reference to the registration number or the number in relation to a name. Similarly, the drug stock list file contains information about the cost of each drug and the quantity that should be held in stock.

The prescriptions file relates to both the patients and drugs file. A patient called M Hunter (No. 4914) was prescribed one Salbutamol inhaler on 5 November 1983. The cost of the inhaler was £4.75. The relations between data in the tables could be much more complex.

For example, you may want to see the total cost of prescriptions which have been issued for Penicillin in the last year and to whom they were given — children are not charged. The prescriptions table must be searched for Penicillin between 1 January 1984 and 31 December 1984 and the registration numbers looked up. The age of the patient must be extracted from the patient file and the quantity prescribed costed for records matching the age criteria.

Next month I'll describe the four programs in detail, look at passwords, record and file sizes, and discuss how you can set about planning and building a database for your own purposes. ■

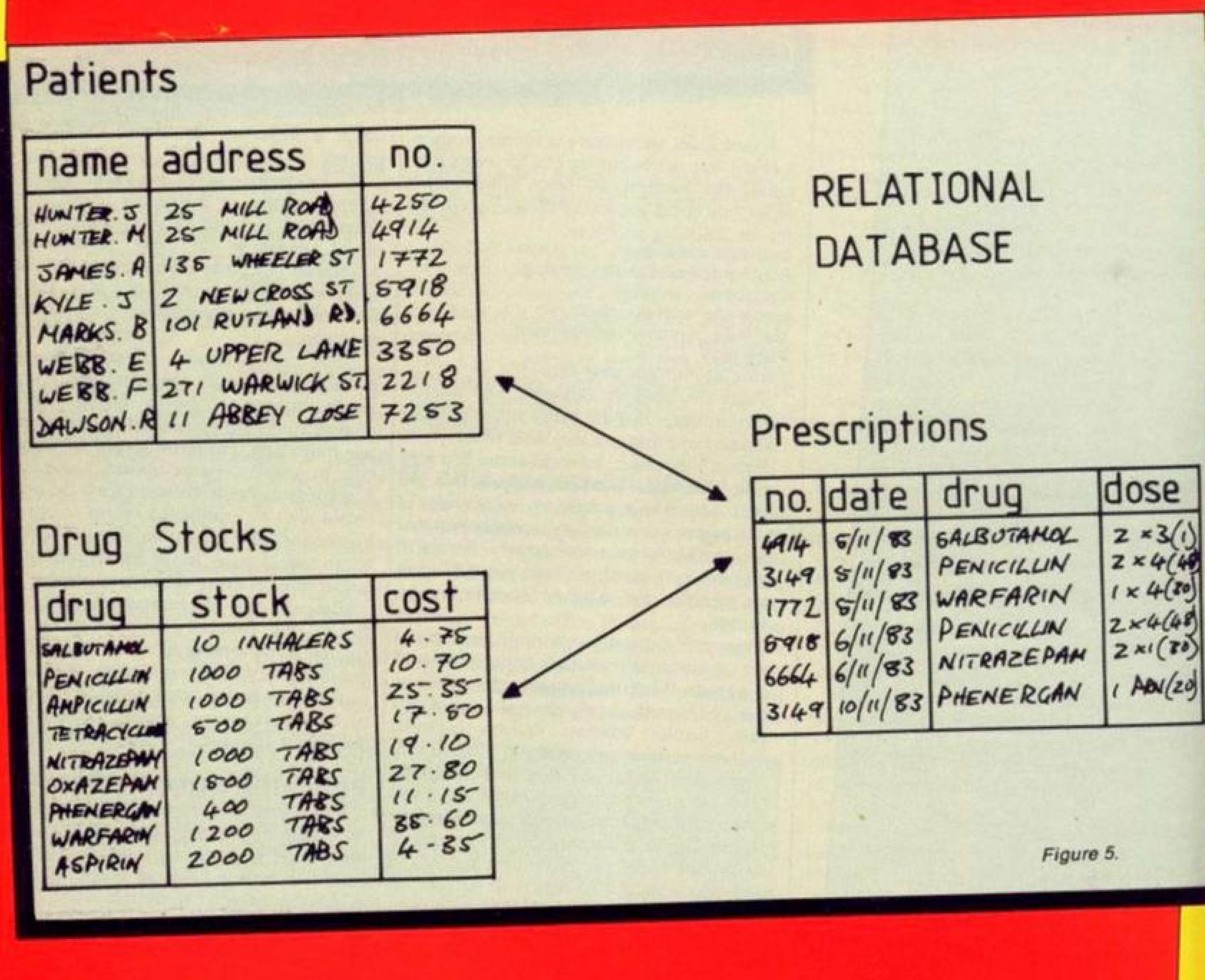
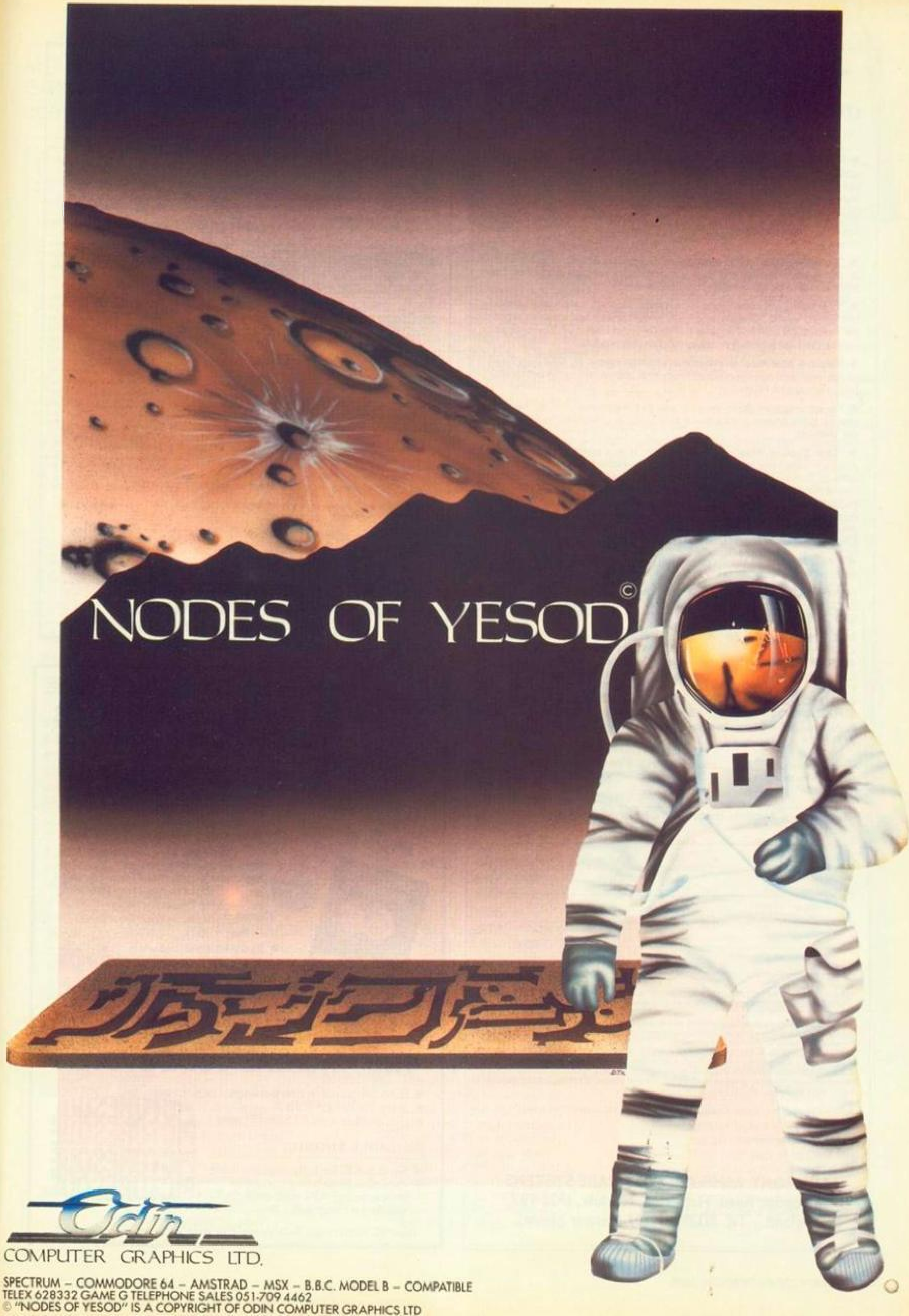


Figure 5.


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● **'The Typing Master'** is not a toy. It is a professionally-written program which has as its sole purpose the teaching of typing/keyboard skills in a way that is friendly and fun. It was written by a typing instructor and it has been marketed world-wide on CP/M, MSDOS, PCDOS and other operating system-based machines over the past three years. It has also been available on Newbrain and BBC Micro (Model A or B) for over a year and is now being released for Amstrad CPC (mono or colour), Commodore 64 and Sinclair QL!

● TAPE formats of the Basic version are available from the following selected list of distributors (media and prices are shown in brackets).

NEWBRAIN (Cassette: £15.00 (no VAT)):
GFG Microsystems, 36 Armitage Way, King's Hedges, Cambridge, CB4 2UE. Tel. (0223) 315120.

BBC MICRO (model A or B) (Cassette, usable with disk: £15.00 + VAT)
AMSTRAD CPC (mono or colour) (Cassette: £15.00 + VAT).
E.C.H. Hobday, The Chestnuts, Rodmersham, Sittingbourne, Kent ME9 0PL. Tel. (0795) 24191.
COMMODORE 64 (Cassette: £15.00 + VAT).
SINCLAIR QL (Cartridge: £20.00 + VAT).
P. Ashpitel, 36 Athlone Avenue, Bury, Lancashire, BL9 5EE. Tel. (061-797) 5214.

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● DISK formats of the Basic program may be obtained from the following suppliers. They also supply a Business/Schools version which incorporates record keeping and many other facilities. Prices shown below are for the Basic version.
APRICOT, SIRIUS & VICTOR (tailored versions). (Disk: £50.00 + VAT).
Anglia Business Computers, 1 Milton Road, Cambridge, CB4 1UY. Tel. (0223) 315580.
CP/M80, CP/M86, MSDOS, PCDOS. (Disk: £50.00 + VAT).
Microcomputer Products International Limited, Central House, Cambridge Road, Barking, Essex, IG11 8NT. Tel. (01-591) 6511.
or,
Software Limited, No. 2 Alice Owen Technology Centre, 251 Goswell Road, London, EC1. Tel. (01-833) 1173.

In case of difficulty contact:

ANTHONY ASHPITEL SOFTWARE SYSTEMS
56 London Road, Harleston, Norfolk, IP20 9BZ, England. Tel. (0379) 852807 (answer phone).

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Features: Commands are single-entry keywords in graphics mode. Syntax is checked on entry. Fully compatible with Spectrum Basic. Microdrive compatible. Comprehensive manual.
NOTE: Release 1.0 is still available for 16/48K Spectrum at £11.00.

ALTER screens colours (general or specific)
AUTO line numbering
BREAK out of code loops
CLOCK digital clock
CURSOR CONTROL CODES allow strings to have complex shapes
DEF KEY user definable keys
DELETE a block of lines
DO-LOOP structure
DPOKE double poke
EDIT specified line
ELSE (used with IF ... THEN)
EXIT leave DO-LOOP
FILL enclosed area with specified ink or paper
GET wait for keypress
JOIN two program lines
KEYIN a string
KEYWORDS new keywords on/off
LIST/LLIST line TO line
USED (used with GOTO, GOSUB)
ON ERROR trap errors (with LINE, STAT and ERROR)
PLOT a string (may contain cursor control codes)
POKE a string
POP Basic's stack
PROC, DEF PROC, END PROC (for named procedures)
RENUM versatile renumber
ROLL all or part of screen in any direction by specified number of pixels, with or without attributes
SCROLL like ROLL, but without wrap round
SORT arrays (very fast)
SPLIT program lines
TRACE program execution
UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOS, YOS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit-by-bit)
BIN$ decimal to binary
CHAR$ number to 2 characters
COSE fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area
HEX$ decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY$ all of memory as a string
MOD modulus
NUMBER 2 characters to number
OR (bit-by-bit)
RNDM fast RND
SCRN$ recognises user graphics
SINE fast sine
STRING$ repeats strings
TIME$ current time
USING$ formats numbers
XOR (bit-by-bit)

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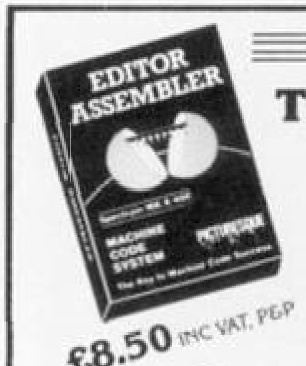
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REPEAT UNTIL

MC Hart gives your CBM-64 an extra command.

```
1 REM **** REPEAT-UNTIL ****
2 REM          C-64
3 :
4 REM  ***  M. C. HART  ***
5 :
6 REM SYNTAX:&R:<EXP>....&U:<EXP>
7 :
8 FOR J=828 TO 960:READ X:POKE J,X:NEXT:END
9 :
10 DATA 201,58,176,234,76,95,3,162
11 DATA 2,189,64,3,149,124,202,16
12 DATA 248,232,134,2,96,76,171,227
13 DATA 162,2,189,60,3,149,124,202
14 DATA 16,248,96,201,38,208,238,32
15 DATA 115,0,201,85,240,37,201,82
16 DATA 208,227,165,2,10,10,170,165
17 DATA 123,157,167,2,165,122,157,168
18 DATA 2,165,58,157,169,2,165,57
19 DATA 157,170,2,230,2,32,115,0
20 DATA 76,174,167,32,115,0,32,115
21 DATA 0,32,158,173,165,97,240,5
22 DATA 198,2,76,64,169,166,2,202
23 DATA 138,10,10,170,189,167,2,133
24 DATA 123,189,168,2,133,122,189,169
25 DATA 2,133,58,189,170,2,133,57
26 DATA 104,104,76,228,167
27 :
28 :
100 REM *** DEMO REPEAT-UNTIL ***
110 :
120 SYS 835 :REM INITIALISE
130 :
140 &R:A=A+1:PRINT"OUTER";A:REM OUTER
150 :
160 J=0 :REM NB ZERO BEFORE INNER LOOP
170 :
180 ::&R:J=J+1:PRINT J,:REM INNER
190 ::&U:J=4:PRINT:REM INNER
200 :
210 &U:A=10:REM OUTER
220 :
230 PRINT"--END--"
240 :
250 SYS 852 :REM RESTORE CHRGOT
READY.
```

THOSE WHO like structured programming or even those who are just interested in 6502/6510 programming for its own sake might be interested in this Repeat-Until.

The routine works by altering Chrgot to look for and process the & symbol followed by R — for Repeat — or U — for Until. Other characters will be passed to the interpreter where they will generate a syntax error.



Unlike For-Next loops in CBM Basic a variable which is used within a loop — such as J in the inner loop in the demo provided — is not initialised back to a starting value and it is the responsibility of the programmer to ensure that such variables are set to the correct value before the loop is entered.

Notice also that the loop will always execute at least once: if a Do-While loop is required which may require the entire loop being skipped if the initial conditions are met then this is best tested for before the Repeat-Until loop is entered. When the routine is in operation, the interpreter will not handle spaces — outside quotes — in excess of one — hence the double colons in lines 180-190.

When Run the code will be read into the cassette buffer — if you totalise the X's in line 8 then they should provide you with a checksum of 15167. The routine is activated by a Sys 835 and restored to normal by a Sys 852. Run 100 runs the little demo routine.

Disassembly.

```
B*
   PC  SR AC XR YR SP
.;0008 30 4F 4F 00 F6
.
033C C9 3A      CMP #$3A
033E B0 EA      BCS $032A
0340 4C 5F 03   JMP $035F
0343 A2 02      LDX #$02
0345 BD 40 03   LDA $0340,X
0348 95 7C      STA $7C,X
034A CA         DEX
034B 10 F8      BPL $0345
034D E8         INX
034E 86 02      STX $02
0350 60         RTS
0351 4C AB E3   JMP $E3AB
0354 A2 02      LDX #$02
0356 BD 3C 03   LDA $033C,X
0359 95 7C      STA $7C,X
035B CA         DEX
035C 10 F8      BPL $0356
035E 60         RTS
035F C9 26      CMP #$26
0361 D0 EE      BNE $0351
0363 20 73 00   JSR $0073
0366 C9 55      CMP #$55
0368 F0 25      BEQ $038F
036A C9 52      CMP #$52
036C D0 E3      BNE $0351
036E A5 02      LDA $02
0370 0A         ASL
0371 0A         ASL
0372 AA         TAX
0373 A5 7B      LDA $7B
0375 9D A7 02   STA $02A7,X
0378 A5 7A      LDA $7A
037A 9D A8 02   STA $02A8,X
037D A5 3A      LDA $3A
037F 9D A9 02   STA $02A9,X
0382 A5 39      LDA $39
0384 9D AA 02   STA $02AA,X
0387 E6 02      INC $02
0389 20 73 00   JSR $0073
038C 4C AE A7   JMP $A7AE
038F 20 73 00   JSR $0073
0392 20 73 00   JSR $0073
0395 20 9E AD   JSR $AD9E
0398 A5 61      LDA $61
039A F0 05      BEQ $03A1
039C C6 02      DEC $02
039E 4C 40 A9   JMP $A940
03A1 A6 02      LDX $02
03A3 CA         DEX
03A4 8A         TXA
03A5 0A         ASL
03A6 0A         ASL
03A7 AA         TAX
03A8 BD A7 02   LDA $02A7,X
03AB 85 7B      STA $7B
03AD BD A8 02   LDA $02A8,X
03B0 85 7A      STA $7A
03B2 BD A9 02   LDA $02A9,X
03B5 85 3A      STA $3A
03B7 BD AA 02   LDA $02AA,X
03BA 85 39      STA $39
03BC 68         PLA
03BD 68         PLA
03BE 4C E4 A7   JMP $A7E4
```

Location	Explanation
033C-035E	This is the initialisation.
035F-0361	See if & character and exit to CHRGOT in Rom if not found.
0363-036C	Get next character from the text and if it is a U then branch forward to $038F — if it is *not* an R then branch back to Goto CHRGOT in Rom — where a syntax error will be generated.
036E-038C	Get the contents of the 'Loop counter' which has been initialised to zero in lines $034D-$034E. Multiply by four to provide an offset and then put into the X register.
038F-039E	The characters & and then U have been identified so bump the text pointers by two (past U and :) and then access a Rom routine to input and evaluate the 'truth' of a condition. If the statement is 'true' then $61 is non-zero so the loop counter is decremented and an exit made to Rom. If "false" i.e. zero then a branch is mae to $03A1.
03A1-03C0	Get the loop counter in A, decrement it and then multiply by four, putting it in an offset to restore the line number and text pointer bytes previously put on the temporary stack. Then pull two bytes off the normal stack and 'throw them away' before accessing a routine in Rom to execute a statement within a line.

Keith Suddick with a program for the CBM-64 which will allow easy reading, writing and alteration of disc blocks.



TRAX

ANY 64 OWNERS who use a 1541 disc drive may well have gone through the trauma of having it turn six weeks' worth of their latest masterpiece into the kind of garbage that makes random numbers look sensible.

Fear not — as many users may know, this is quite often caused by an error in only one of the many blocks that may be used by the disc drive to store the file. In many cases it is quite easy to fix these errors — if not quite so easy to trace them in the first place.

Consider the way in which the 1541 stores files on a disc, take the most common type — a program file. First of all, the file has to have an entry in the directory. This directory entry contains details of the name, type and length of the file and the track and sector numbers of the block on which the actual file starts.

Each block on the disc is 256 bytes long and the details of the formats are given in the user manual for the disc drive. Briefly, however, in each block the first two bytes, or links, point to the next block in the file and the following 254 bytes are data in the file itself. The last block in a file is marked by links that are invalid track and sector numbers.

When an error occurs on a disc it can corrupt a file in several ways. The error may occur in the data part of the file, changing a character or keyword in a program for example. Another type of error could occur if the links from one block become corrupted and point to an incorrect block as the next in the file.

In both cases the error needs to be found — this may involve careful examination of the file as stored on the disc. Once the error is identified, attempts can be made to correct it, in the case of corrupted links this may involve searching areas of the disc for pieces of the file and then linking them back together. It is not always possible to recover the whole of a file but unless the error is compounded by extensive writing to the disc afte the error occurs, then perhaps only one or two blocks will be lost.

The details of detection and remedy of such errors on a disc is beyond this article and is more related to experience and even reasonable guess-work than a set of rules, but the manuals and reference guides provide all the information on how things are supposed to be stored on the disc and comparison with this should highlight the corruption.

Finding the error will probably mean careful inspection of the data on the disc and then some alterations to correct it. This is where the program Trax becomes useful.

Although the 1541 allows the use of random files, through which it is possible to access any block on the disc in any order, a program is needed to make use of this. While a simple program may suffice to deal with a particular situation, Trax is a more general program which allows easy reading, writing and alteration of disc blocks as well as allowing the use of the 1541's built in DOS commands.

When the program is running it will attempt to identify the disc that you want to work on. It does this by loading in the directory header and block allocation map from track 18, sector 0 and examining it — although the BAM is not used. During execution various things are displayed on the screen in several "windows".

The track and sector numbers of the block currently in the computer's memory are shown along with the track and sector numbers to which the current block is linked or points to. Along the bottom of the screen the disk name, ID and operating system version are shown and below this the error channel form the disc drive is shown.

The largest of the windows on the screen is used to display the actual contents of the block in memory. There is a choice of either hexadecimal or ASCII displays, although editing can only be done hexadecimal mode. Because of the size of a block — 256 bytes — only one half of the block is displayed at any one time, in the bottom right hand corner of the screen is an indicator showing whether the display is the top or bottom half of the block, the bytes are also numbered in groups of eight. Finally, the top lines of the screen are used for communications with the program — prompts will appear here along with any responses that you may type.

In the case of a hard copy version of the display, both the hexadecimal and ASCII data is printed along with the track, sector, name, etc.

The commands provided by Trax are all invoked by single keys to make editing easier, although as a precaution commands that move data to and from the disc are obtained via the control key — Ctrl.

The commands may be summarised:

Ctrl R: Read a specified block from the disc into memory.
Ctrl W: Write the data in memory to the specified block on the disc.
Crtl U: Update the current block on the disc with the data in memory.
Ctrl F: Follow the links from the current block and read the next block if possible.
Ctrl P: Print the current block contents on a printer.
Ctrl Q: Quit the program.

(continued on next page)

(continued from previous page)

- *: Switch between ASCII and hexadecimal display modes.
- ↑: Switch page to display other half of block.
- @: Send following DOS command to disc drive.

In addition the cursor keys and the Home key may be used to move around the block display to edit the data.

Note that all numbers are in hex including the track and sector numbers typed as responses to read and write commands although leading zeros may be omitted. The only exception to this is the error channel which shows numbers in decimal in line with the disc manual which gives more details on error conditions. DOS commands are sent to the disc drive exactly as typed, so the normal syntax applies. In addition, entering just return when asked for a track or sector number will substitute the current value and pressing the CLR key — Shift Home — during a response will cancel the command.

The program is relatively straightforward to type in; the Commodore control codes are as usual. The only exception is line 50 where the reverse characters u,w,f,r,p and x inside the quotes are obtained by pressing Ctrl and the given letter key whilst in quotes mode.

Don't forget to save a copy of the program before trying to use it and I strongly recommend testing it out with a blank but formatted disc to ensure the program is correct.

For anyone who doesn't want to type the program in I can supply tape copies for £2.00, write to: Keith Suddick, 6 Ravel Court, Jarrow, Tyne and Wear, NE32 3BW.

Place the required disc in the drive and run the program. Pressing return when asked will result in the program reading in track 18 sector 0 — the directory header, and getting from this data the name, id and operating system version of the disc. The first page of the block will be displayed along with the links and error channel. When the command prompt appears at the top of the screen you can either enter one of the commands listed above or use the cursor keys to move the "cursor" around the block.

If you want to change a byte in a block then simply put the cursor on that byte and type the new value — remember the values are shown in hexadecimal — you will see the byte change and although it will have been altered in memory the change is not sent to the disc until either an Update command is used to rewrite the current block or a Write command ius used to place the data in any block on the disc. Note that should you change either of the first two bytes in a block — the links, then the link display will change accordingly and any Follow commands will use the new values even if the block has not been written to the disc.

The first directory block is linked to track 18 sector 1 which is the start of the file entries and you can follow this link from the directory header by using the Follow command. The first files in the directory will be in this block and if you switch the display to ASCII using * you will be able to see the file names more easily although you must change back to hex to be able to edit the block.

Since only half of the block is displayed at any time you can see the other half by using the ↑ to change the display.

If you find the file you want in the directory then this entry will tell you where the actual file starts and you can then get the first block of the file using the Read command and then follow the rest of the file — note that Follow will not work from the directory entry as this will link to the next directory block.

■

Program breakdown.

Lines	Function
0-90:	Initialisation.
100-180:	Main input loop. Edit block if requested and check for valid commands.
200-260:	Get track and sector numbers for read and write commands.
300-360:	Produce printed copy of current block.
400-499:	Move "cursor" around block display.
500-590:	Execute commands.
600-630:	Display block on screen.
700-760:	Convert to and from hex/decimal.
800-899:	Read specified block from the disc, update current track and sector values and set links to next block.
900-999:	Write current block data to specified block on disc.
1000-1020:	Read and display error channel from disc drive.
2000-2150:	Draw screen "windows".
2200-2300:	Attempted to identify disc — read track 18 ($12) sector 0.
2400-2550:	Error messages for unreadable dics.
3000-3070:	Input a string subroutine.

```
0 rem  trax : 1541 disk editor
1 rem  k. suddick  mar 1985
10 dimb(255):cl=214
20 r$=chr$(13):d$=chr$(20):z$=chr$(0):hx$="0123456789abcdef"
30 cl$=""
40 cl$=cl$+""+mid$(cl$,2)+""
50 ok$=""
60 bl$=r$+"":forx=0to8:bl$="   "+bl$:next:c7=7:a0=48:c2=2:b0=128
70 ax=16:et=8:u=1:ft=15:t4=40:c3=3:ax=16:c9=9:m$(0)="hexadecimal.":m$(1)="ASCII."
80 e$(0)="1st":e$(1)="2nd"
90 gosub2000:goto100
100 getk$:ifk$=""then100
110 k=asc(k$):ifk<48ork>70or(k>57andk<65)then160
120 pokecp,peek(cp+u):pokecp+u,k+64*(k>57)+b0
130 x=cx+cy*et+p*b0:b(x)=ax*(b(x)andft)+k-48+7*(k>57)
140 ifx<2thenprint""tab(150)"linking":gosub850:print"";
150 goto100
160 forx=1tolen(ok$):ifk$<>mid$(ok$,x,1)thennext:goto100
170 ifx<6thenonxgosub400,410,420,430,440:goto100
175 onx-5gosub500,510,520,530,540,550,560,300,999
180 printcl$"command >";:goto100
200 mx=2:tt=t:ss=s:print""tab(8)
210 print"track : ";:gosub3000:iferthenreturn
220 ifl$<>""thenh$=l$:gosub750:tt=d:goto240
230 d=tt:gosub700:print""tab(16)h$
240 printtab(8)"sector : ";:gosub3000:iferthenreturn
250 ifl$<>""thenh$=l$:gosub750:ss=d:return
260 d=ss:gosub700:print""tab(16)h$:return
300 open4,4,7:print#4:printcl$"hardcopy being printed.
310 print#4,"disk : "dn$"  ID : "id$"  OS : "os$r$
320 d=t:gosub700:print#4,"track : "h$"   ";:d=s:gosub700:print#4,"sector : "h$r$
330 forx=0to15:d=y*16:gosub700:print#4,h$" : ";:a$="":forx=0to15
340 c=b(y*ax+x):d=c:if(cand127)<32thenc=46
350 a$=a$+chr$(c):gosub700:print#4,h$" ";:next
360 print#4," / "a$:next:print#4,r$r$
370 close4:return
400 cx=(cx+1)and7:goto450
410 cx=(cx-1)and7:goto450
420 cy=(cy+1)and15:goto450
430 cy=(cy-1)and15:goto450
440 cx=.:cy=.
450 ifdmthenreturn
460 fori=0to1:pokecp+i,peek(cp+i)and127:next
470 cp=1140+cy*t4+cx*c3
480 fori=0to1:pokecp+i,peek(cp+i)or128:next
499 return
500 printcl$"updating block."
501 tt=t:ss=s:gosub900:return
510 printcl$"> write ";:gosub200:iferthen590
511 gosub900:return
520 printcl$"trying to follow link.":tt=nt:ss=ns
521 gosub800:iferthenreturn
522 gosub600:return
530 printcl$"> read  ";:gosub200:iferthen590
531 goto521
540 printcl$"enter DOS command -":mx=38
541 gosub3000:iferthen590
542 close1:print#15,l$:gosub1000:open1,8,2,"#":return
550 p=1-p:printcl$"displaying "e$(p)" page.":goto600
560 dm=1-dm:printcl$"switching display to "m$(dm):goto600
590 printcl$" cancelled >":forx=1to200:next:return
600 print"";:forx=.to15:by=y*et+p*b0:d=by:gosub700:print""bl$""h$"";
610 forx=.to7:d=b(x+br):ifdmthenpoke1149+y*t4+x*c3,d:goto630
620 gosub700:printh$"";
630 next:print:next:poke1981,226-p*b8:goto440
700 h$=mid$(hx$,d/ax+u,u)+mid$(hx$,(dandft)+u,u):return
750 h$="00"+h$:d=asc(right$(h$,c2))-a0:d=(d+c7*(d>c9))*ax
760 d=asc(right$(h$,u))-a0:d=d+c7*(d>c9)+d:return
800 print""spc(150)"reading":gosub1000:iferthen880
810 print#15,"u1:2,0,"tt;ss:gosub1000:iferthen880
820 t=tt:s=ss:d=t:gosub700:t$=h$:d=s:gosub700:s$=h$
830 print#15,"b-p:2,0"
840 forx=0to255:get#1,a$:b(x)=asc(a$+z$):next:p=.
850 nt=b(0):ns=b(1):d=nt:gosub700:nt$=h$:d=ns:gosub700:ns$=h$
860 print""spc(236)t$""s$
870 printr$spc(156)nt$""ns$
880 print""tab(150)"
899 return
900 print""spc(150)"writing
910 print#15,"b-p:2,0"
920 forx=0to255:print#1,chr$(b(x));:next
930 print#15,"u2:2,0",tt;ss:gosub1000:goto800
999 printcl$"exit...":close1:print#15,"i":close15:print"":end
1000 pokecl,22:printr$"":er$=""
1010 get#15,a$:ifst=.thener$=er$+a$:ifst=.then1010
1020 er=val(er$):er$=er$+mid$(cl$,2,33-len(er$)):printer$"":return
2000 poke53280,0:poke53281,0
2010 print""
2020 forx=1to16:print"|  |"tab(27)"|":next
2030 print"
2040 print"                        ID :   OS :  |
2050 print"|name :
2060 print"|
2070 print"|ID :
2080 print"
2090 bl$="                  track :
2100 bl$=bl$+"|                 sector :
2110 bl$=bl$+"|
2120 bl$=bl$+"                  "spc(29);
2130 print""tab(28)"                 ":printtab(28)bl$bl$""
2140 print"|"spc(9)"|"spc(29)"":print""tab(29)"linked to
2150 print""tab(29)"current":print""tab(29)"current":print"  press RETURN to ID disk."
2200 print""
2210 getk$:ifk$<>r$then2210
2220 printcl$
2230 open15,8,15,"i":gosub1000:iferthen2500
2240 open1,8,2,"#"
2250 tt=18:ss=0:gosub800:gosub1000:iferthen2400
2260 dn$="":forx=144to161:dn$=dn$+chr$(b(x)):next
2270 id$=chr$(b(162))+chr$(b(163)):os$=chr$(b(165))+chr$(b(166))
2280 pokecl,20:printr$""dn$tab(30)id$tab(36)os$cl$;
2300 p=.:cx=.:cy=.:gosub600:goto440
2400 printcl$"  directory error - cannot ID disk.
2410 dn$="?":id$="??":os$="??":goto2280
2500 printcl$"cannot initialise drive - unrecoverable
2510 print" error.  press RETURN to re-start.
2520 getk$:ifk$=""then2520
2530 ifk$=r$thenrun
2540 ifk$=""then999
2550 goto2520
3000 er=.:l$="":print"";
3010 getk$:ifk$=""then3010
3020 ifk$=r$thenprint" ":return
3030 ifk$=""thener=1:return
3040 ifk$=d$thenifl$<>""thenl$=left$(l$,len(l$)-1):printd$;:goto3010
3050 if(asc(k$)and127)<33then3010
3060 iflen(l$)=mxthen3010
3070 l$=l$+k$:printk$"";:goto3010
```



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It's the year 2085. Only a handful of people have survived the robot wars that rocked the Solar System. In a final desperate bid for survival a Tacheon propelled star cruiser has been developed on Earth to transport survivors to new star system. But the cruiser relies on rare Ionian crystals for its power; crystals which are only abundant on Jupiter's second moon Io. A moonbase established on Io is under constant attack by aliens from Jupiter. It is your mission to escort the men and their precious crystals safely from the surface of Io to the Dropzone where the landing pad is located. You are equipped with the latest pulse-laser back-pack system which will make you invisible and indestructible for short periods of time. You must succeed, the future of the human race depends on you alone!
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SPACE JUNK

Nalin Sharma continues his epic for the CBM-64.

HERE IS a reminder of the loading and game instructions for Space Junk.

Insert cassette, press Shift and Run/Stop and start your cassette recorder. Loading time is about two minutes. Put your joystick into Port 2.

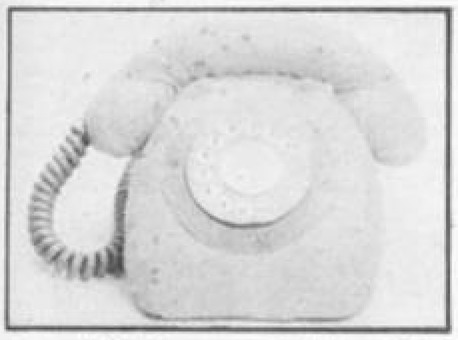
Can you retrieve all 32 satellites by mastering control of your ship, which can move up, down, left and right and can also fire bullets?

However, beware of the four yellow junkies which patrol the skies. Unless you can work out how to destroy them you're in trouble! To help you there's a radar at the top of the screen which will pinpoint the junkies and any miscellaneous junk which appears from time to time and can be retrieved for bonus points.

After every two sheets you'll get an extra life and an attempt at the challenge stage. Here you have 99 units of time to turn the four junkies into stormer — if you succeed you'll get 8000 points! Below your score is shown the number of satellites left to collect, together with the number of lives left.

Pressing F7 will freeze the game and pressing the Space-Bar will restart it. Tape copies of the program are available for £3.25 from Nalin Sharma, 35 Kitchener Road, Walthamstow, London E17 4LJ.

```
note: enter letters as
capitals
34f0 c13a535441204849 2d4
34f8 474848b9aa35000a 279
3500 35b68a4c44412023 289
3508 36001b35bb8a5354 272
3510 41204849474848b9 282
3518 aa36002635ca8a4c 2db
3520 4441202335903525 167
3528 d48a535441205348 301
3530 49454c44004635e8 281
3538 8a4a535220534554 285
3540 5241444152005735 1f6
3548 f48a5349c3434520 385
3550 4c4458202330006c 1c7
3558 35f68a9c53494420 351
3560 4c444120534f554e 236
3568 442c58007d35f88a 2fc
3570 5354412044555053 244
3578 49442c58008835f9 2c7
3580 8a4c444120233000 1ce
3588 9935fa8a53544120 35a
3590 5748494348322c58 229
3598 00a135fb8a494e58 34a
35a0 00ad35fc8a435058 353
35a8 2023323500ba35fa 297
35b0 8a424e45209c5349 2b7
35b8 4400c235108b5254 27c
35c0 5300d735748b5241 2f1
35c8 53549a34204c4441 266
35d0 20534154539100e2 2ce
35d8 357e6b434d502023 261
35e0 3100f235888b424e 2fb
35e8 452046494e524153 228
35f0 34000336928b4a53 227
35f8 522042554c4c434f 233
3600 4c53001436978b4a 255
3608 5352205348495043 23c
3610 4f4c530025369c8b 270
3618 4a5352204d495343 23b
3620 48444c52003536a6 23b
3628 8b46494e52415334 282
3630 202c3000d22f8df2 2fc
3638 563252454c204259 226
3640 54203234382c3234 1a4
3648 392c3235342c3235 193
3650 3000ed2f93f25632 356
3658 5741564520425954 242
3660 2033332c33332c33 177
3668 332c333300353094 1ce
3670 f25457534f554e44 326
3678 2042595420302c32 1cd
3680 34302c31362c3232 187
3688 342c33322c323033 18b
3690 2c34302c3139322c 18c
3698 36342c3137362c38 198
36a0 302c3136302c3936 18e
36a8 2c3134342c313132 185
36b0 2c313238007e0d9e 213
36b8 f2485950534f554e 328
36c0 442042595420302c 1cf
36c8 31362c33322c3438 190
36d0 2c36342c38302c39 18f
36d8 362c3131322c3132 185
36e0 382c3134342c3136 190
36e8 302c3137362c3139 190
36f0 322c3230382c3232 188
36f8 342c32343000c730 1ed
3700 a6f2524546534f55 36e
3708 4e44204259542032 1f3
3710 34302c3232342c32 186
3718 30382c3139322c31 18d
3720 37362c3136302c31 18d
3728 34342c3132382c31 18c
3730 31322c39362c3830 192
3738 2c36342c34382c33 18d
3740 322c31362c3000e1 202
3748 30b2f29153432042 35d
3750 59542039362c3134 1cd
3758 342c36342c313736 194
3760 00f23018f6802022 2f2
3768 535041434532222c 1ec
3770 380000005c8c4445 1a9
3778 58008b375f8c4a53 2a2
3780 5220504c4f545341 245
3788 5453009337648c52 2b3
3790 545300ae37698c52 2d3
3798 4153549a32204c44 264
37a0 4120534154539120 24d
37a8 214c45465400b937 23c
37b0 6e8c434d50202331 24e
37b8 00c537738c424551 2d3
37c0 20acaa3300cd3778 325
37c8 8c52545300ac377d 315
37d0 8c4c445820534341 26b
37d8 50455800ee37828c 320
37e0 4a535220434c4541 224
37e8 525341545300fd37 2c1
37f0 878c4c4458205343 2b1
37f8 4150455800053889 1f4
3800 03030f0f3f3fffff 2a0
3808 ffffffffffffffff 7f8
3810 80a0e0eafafafefe 6e2
3818 0000000080a0a8aa 272
3820 aaaaeaeafafafefc 716
3828 80a0a08080000000 2c0
3830 0000000000010205 008
3838 ea12a548902040bf 398
3840 7f00000001ff00ff 27e
3848 ff00ff00010306fc 304
3850 f83060c080ff00ff 4c6
3858 ff00ffc080000001 33f
3860 010307060f1830f8 160
3868 0018181818183c3c 0f0
3870 6666667e66c3ffc3 49b
3878 c37ec300ff000000 303
3880 80c0e060f0180c1f 3b3
3888 0000000000000003 003
3890 0f1f3f3d3f1f0f01 118
3898 00000000000fffff 20d
38a0 bffbfffddffffffc 78f
38a8 000000017fffdffb 359
38b0 ffddfff7ffffe000 6b0
38b8 000000ffffffddff 4d9
38c0 effffbbffffe0000 5a5
38c8 000000e0f3f0fc6e 432
38d0 efffbefcf0000000 498
38d8 1038386c7cbefe7f 313
38e0 fff7bffeeefebdfd 759
38e8 ebd3b83b6dfdffcf 5ec
38f0 0000000101032277 09f
38f8 7bfbfbd9fdecbdfe 6ee
3900 0000000000000000 000
3908 ddfd7dedfbf3f7ef 718
3910 000081c1c367e7ed 440
3918 efe6f6b5dbfbf677 6c3
3920 b7cadbef66f7dbff 685
3928 c0c0e4eaeb6ff7f6 699
3930 b6f57b6bbdb5aeda 5bf
3938 efafb7faf9cdb6ff 6ca
3940 0006330c63cc63cc 2a3
3948 330f030303030d3b 096
3950 0060cc30c633c633 34e
3958 cc70c0c0c0c0b0dc 5c8
3960 0000000000181830 060
3968 0000007e00000000 07e
3970 ffffffffffcfcfff 798
3978 0040406060703038 216
3980 1c1e0f0703000000 053
3988 00000000e0f83e00 296
3990 0000001818000000 030
3998 000000c3dbdbffdb 453
39a0 dbe7dbffdbe7dbff 738
39a8 e7ffdbffffdbff7e 717
39b0 5555ffdbe7e75ac3 56f
39b8 e7e7ffff7e000000 44a
39c0 6666ffffc3bd9999 57c
39c8 bdc3ffff7e000000 3fc
39d0 ffff815e575f5780 46a
39d8 ffff9177fa6ffc44 5b1
39e0 ffff03f5dd79ed03 53c
39e8 ffffff87ff87ffff 708
39f0 ffc3dbdfdfdbc3ff 6f8
39f8 ffc7bbf7efffefff 754
3a00 ffffffffffffffff 7f8
3a08 ffff0333033333ff 39c
3a10 ffff0733073307ff 378
3a18 ffff03333f3303ff 3a6
3a20 ffff0733333307ff 3a4
3a28 ffff033f073f03ff 388
3a30 ffff033f073f3fff 3c4
3a38 ffff033f333303ff 3a8
3a40 ffff3333033333ff 3cc
3a48 ffff03cfcfcf03ff 570
3a50 ffff03cfcfcf0fff 57c
3a58 ffff3333073333ff 3d0
3a60 ffff3f3f3f3303ff 3f0
3a68 ffff3303333333ff 3cc
3a70 ffff0333333333ff 3cc
3a78 ffff0333333303ff 39c
3a80 ffff0333033f3fff 3b4
3a88 ffff033303f3f3ff 51c
3a90 ffff0733073333ff 3a4
3a98 ffff033f03f303ff 438
3aa0 ffff03cfcfcfcfff 63c
3aa8 ffff3333333303ff 3cc
3ab0 ffff33333333cfff 498
3ab8 ffff3333330333ff 3cc
3ac0 ffff3333cf3333ff 498
3ac8 ffff333303f303ff 45c
3ad0 ffff03f3cf3f03ff 504
3ad8 0103060c183f60ff 1cc
3ae0 0103070c183060c0 17f
3ae8 0000000103ff00ff 282
3af0 ff00ff0103060c1f 233
3af8 3f60c08000fe00ff 3dc
3b00 ff00ff80000102e4 365
3b08 c912244890af40ff 3c5
3b10 0000000000000000 000
3b18 000000000000ffff 1fe
3b20 00000000ffff0000 1fe
3b28 0000ffff00000000 1fe
3b30 ffff000000000000 1fe
3b38 0000000000000000 000
3b40 03060c1830e0c080 27d
3b48 ff06fc183060c080 3e9
3b50 0018185a3cdb7e18 237
3b58 000000183c187e18 102
3b60 00c0d8dbfb1b1f18 3c0
3b68 000018781e180000 0c6
3b70 000000007ee7e37e 2c6
3b78 00000000001e391e 075
3b80 0000000000000606 00c
3b88 000000003c000000 03c
3b90 0000000018000000 018
3b98 1f7ff08000c0f03c 3fa
3ba0 ffc000000000007f 23e
3ba8 c0301010107fffc 2cb
3bb0 ffffc3c3c3c3ffff 708
3bb8 ffffebebebebffff 7a8
3bc0 ffffd7d7d7d7ffff 758
3bc8 ff9999ffff9999ff 660
3bd0 ffe7e7ff9999ffff 6fc
3bd8 3fffc3c3c3c3ffff 648
3be0 fcffc3c3c3c3ffff 705
3be8 0103070f1f3f7fff 1f6
3bf0 80c0e0f0f8fcfeff 701
3bf8 000000003c3c5555 122
3c00 0103070f1f3f7f00 0f7
3c08 ff99ff99ff99ffff 6c6
```



Available on Telsoft.

```
3c10: ffebebffebebffff 7a8
3c18: ffc3c3ffc3c3ffff 708
3c20: ffffffffffffff00 6f9
3c28: ffff99ff99ffff00 62d
3c30: ff00ff00ff00ff00 3fc
3c38: ff55ff55ff55ff55 550
3c40: fefdfbf7efdfbf7f 6f9
3c48: 7f7e7c7870604000 301
3c50: 0000000000003f3f 07e
3c58: 303030333f3f0000 141
3c60: 000f3f3f00000000 08d
3c68: 0000003c003cc3ff 23a
3c70: 3c3c3c3cffff3c3c 366
3c78: 3c3cffff3c3c3c3c 366
3c80: 000000000000fcfc 1f8
3c88: 0c0c0cccfcfc0000 2e8
3c90: 00f0fcfc00000000 2e6
3c98: 000000300c330f30 0ae
3ca0: 0c300c300c300c30 0f0
3ca8: 0c300c300c7e7eff 27f
3cb0: 0000000000f0f818 200
3cb8: 000000300cf0cc30 228
3cc0: 00000000000f1f18 046
3cc8: 003cc3ff00ff003c 339
3cd0: 2a3f003c003c003c 11d
3cd8: 2a3f003c003c00ff 1e0
3ce0: a6fc003c003c003c 258
3ce8: a6fc003c003c00ff 31b
3cf0: 000000001f3264ff 1b4
3cf8: 00000000ff2244ff 264
3d00: 000f3b67ff7f88ff 3b6
3d08: 0000fcb6fef800ff 4a7
3d10: 00000000ff468cf8 2c9
3d18: 0000000101010000 003
3d20: 00000103070f1e3d 075
3d28: 7fff00ffffff0000 47b
3d30: 0103070f001e1e1e 074
3d38: 0000e0d0b060c080 400
3d40: fdfb07eedfbe7df0 5f7
3d48: e7d7b770e0c18101 508
3d50: ffff1f3eff03f70f 463
3d58: debd7bf70eece6e0 5cf
3d60: fefd1833ebdbb670 534
3d68: e0c0800000000000 220
3d70: ffff00ffffff0000 4fb
3d78: 0000070f1e3d7bf7 1e3
3d80: eedc38b0a0000000 3d2
3d88: 0000600000006000 200
3d90: 00001f307f00ffdf 2ac
3d98: fcff00ffffdedeff 6b4
3da0: ff00ffc0c0c0c0ff 5fd
3da8: 0000ff00ff00ffff 3fc
3db0: 00ff00ffff6666ff 4c6
3db8: ff00ffe6ffe6ffff 6c7
3dc0: 00ff00ffe16d6de1 49a
3dc8: ff00ff67ff67ffff 5c9
3dd0: 0000f80cfe00ffff 400
3dd8: 73ff00ffc3dbdbc3 5ad
3de0: ff00ffff3333ffff 561
3de8: 3ffff0f7f0fff0ff 703
3df0: 3f00030303030a2a 07f
3df8: ff05000000ff0000 203
3e00: ffff03f3c3f303ff 5ac
3e08: ff50000000ff0000 24e
3e10: fcff0333333303ff 399
3e18: fc00c0c0c090a0a8 504
3e20: 000000ffdeff0378 357
3e28: 7effff77f7f7f77f 657
3e30: ffffadfffff32000 5ec
3e38: 000000fffbbfe10c 3a6
3e40: 77ffffbbbf7f77f7 5dc
3e48: ff2f7b77ffffd000 546
3e50: 000000ffffdff926 3fc
3e58: 8ffffb7b7f7fffef 5f0
3e60: ef7fefffdf3e0500 4ce
3e68: 000000ffdffd0770 352
3e70: efef777ffff7f777 638
3e78: dfdffff7777f3a10 4f4
3e80: 000000ffefff8339 3a9
3e88: 7ff77773fbfb7f7f 554
3e90: efeffff7f77e0c00 555
3e98: 00000000c0f8bcef 363
3ea0: c0f0f8dcbef6abdf 6f2
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3eb0: 00000000031f5df7 156
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3f08: fb05ff00ff00ff00 3fd
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3f28: ff00ff00ff00ff00 3fc
3f30: ff00ff00ff00ff00 3fc
3f38: ff00ff00ff00ff57 453
3f40: ff00ff04ff00ff01 401
3f48: ff00ffffff00ffff 5fa
3f50: ff00ffffff00ffe3 5de
3f58: ff00df00ff006101 33f
3f60: ff01ff3aff00ff00 437
3f68: ffffff00ff00ff00 4fb
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3f90: 04fb000c00ff00bf 2c9
3f98: 00ff00ff00ff00ff 3fc
3fa0: 0cfb00ff00ff006f 374
3fa8: 00ff00ff2cff00ff 428
3fb0: 00ff00ff00ff00ff 3fc
3fb8: 00ff00ff00ffac9f 448
3fc0: 00ff43fb00ff03be 3fd
3fc8: 1bff934300ffdb43 40d
3fd0: 00ff00ffffffd3ff 5ce
3fd8: 00ff00ff00ffffbc 4b8
3fe0: 00ff00ff00ff00ff 3fc
3fe8: 00db00ff00ff00ff 3d8
3ff0: 00ff00ff00ff43ff 43f
3ff8: 00ff00ff00ff00ff 3fc
4000: 208aff4c50400012 297
4008: 40f54b4350582023 2ae
4010: 30002040fa4b424e 265
4018: 452053434c503200 1c9
4020: 2f40044c4c445920 1c8
4028: 534341504558003d 201
4030: 40094c4a4d5020a2 23e
4038: 434f4c4d0055402c 1ec
4040: 4c54414b45534352 259
4048: 4f4c4c204c444120 1f6
4050: a96c8d1803a9408d 333
4058: 1903a99320d2ffa9 3f2
4060: 0820d2ffa9008d20 34f
4068: d08d21d0a2ff9a78 501
4070: a90d8d1403a9418d 2d1
4078: 150358a9d08d16d0 35c
4080: a9008573850e8512 2cb
4088: 850f8510a9018511 269
4090: 850d8d1ad0ad11d0 397
4098: 297f8d11d0a9518d 39d
40a0: 12d0a9ff8d19d0a9 4a9
40a8: 008d0edc20da4420 2d5
40b0: ec452000434cf04a 39a
40b8: a273a9009500e6e0 41b
40c0: 0bd0f9a99320d2ff 581
40c8: a93f85fb85fda905 498
40d0: 85fca9d985fea011 537
40d8: a247a917209546a0 344
40e0: 29a91085fca9c085 451
40e8: fea95191fba90091 4be
40f0: fda9011865fb85fb 49f
40f8: 85fda90065fc85fc 50d
4100: 1869d485fec9ffd0 570
4108: e0e84c0941a50dc9 3d9
4110: 01d030ad16d029e8 3a5
4118: a673e001f002050f 300
4120: 8d16d0e60da9818d 41c
4128: 19d0ad11d0297f8d 3ac
4130: 11d0a9ca8d12d020 3e3
4138: 7b48204043204f53 228
4140: 4cfa41c902d02ba9 3f6
4148: 1f8d18d0ad16d029 350
4150: f0910050f8d16d0 296
4158: e60da9018d19d0ad 440
4160: 11d0297f8d11d0a9 3a0
4168: e28d12d020a9434c 3a9
4170: fa41c903d020ad6f 413
4178: 528d21d0e60da981 3ed
4180: 8d19d0ad11d0297f 3ac
4188: 8d11d0a9fb8d12d0 481
4190: 204c534cfa41c904 313
4198: d05da901850da900 312
41a0: 8d21d0a9138d18d0 3af
41a8: ad16d029f88d16d0 427
41b0: a9818d19d0ad11d0 42e
41b8: 297f8d11d0a9518d 39d
41c0: 12d0203a44a511c9 2ff
41c8: 02f013a50e38e510 2e5
41d0: 850e2980c960d014 369
41d8: 200b474cec41a50e 2fe
41e0: 186510850ec90830 221
41e8: 03201a46a50e2907 168
41f0: 850f850e2049534c 22f
41f8: 004268a868aa6840 30c
4200: a513c901d050a513 35c
4208: c900d04aa5c5c904 41a
4210: d007a90185154c56 2bd
4218: 42c905d007a90285 317
4220: 154c5642c93cd007 2d5
4228: a90385154c5642c6 2f0
4230: 14a514c900d01fa9 32e
4238: 148514adfa044900 321
4240: 8dfa048d4a05adfb 40f
4248: 0449008dfb04ad4b 351
4250: 0549008d4b05ad21 279
4258: 70c901f0034c4e43 30a
4260: a9008d0d70a9058d 2ee
4268: 0e70a200bc2270c0 32e
4270: 00d0034c344388bd 2db
4278: 06702901c901f028 284
4280: de2270bd2370c900 38a
4288: f0034c34439840bc 352
4290: 4f70b96e709d0470 367
4298: b9d2709d057068a8 41d
42a0: bd087009019d0870 254
42a8: bd2770dd2870f006 3bf
42b0: fe27704c3443a900 301
42b8: 9d2770fe2570bd25 3a9
42c0: 70dd2670f0034c34 356
42c8: 43bd24701869019d 2b3
42d0: 2470bd377069009d 2fe
42d8: 3770c904d005a900 2f2
42e0: 9d3770c96070187d 362
42e8: 24708502b963707d 324
42f0: 377085029840a000 2af
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4300: 257068a0b9667018 34c
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4310: 7d37708503a000b1 2fd
4318: 02c961d007fa2051 35e
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4328: 087029fe9d0870a9 35d
4330: 019d2370e00ef016 325
4338: 8a186907aa4c6c43 2b6
4340: a200bd04709d00d4 344
4348: e0e019d0f5604c31 483
4350: eaa9019d23709d26 387
4358: 70a9009d2570a9ff 3f3
4360: 9d24709d3770bd28 35a
4368: 709d2770bd087029 302
4370: fe9d0870a9009d04 35d
4378: 709d05709d4c7060 33b
4380: a9058d0e70a9408d 32f
4388: 0f70a90a8d1070a9 2e8
4390: 008d1170a2002051 221
4398: 43a207205143a20e 250
43a0: 205143a9018d2170 27c
43a8: 60ce7a52ad7a52c9 43c
43b0: 00d01aa9048d7a52 2f0
43b8: ae7652e6e004d002 414
43c0: a2008e7652bd7e52 385
43c8: a0dc205945ce7b52 3d5
43d0: ad7b52c900d01aa9 3d6
43d8: 018d7b52ae7752e8 3ba
43e0: e004d002a2008e77 35d
43e8: 52bd8252a0dd2059 3d9
43f0: 45ce7c52ad7c52c9 425
43f8: 00d01aa9038d7c52 2f1
4400: ae7852e8e00ad002 41c
4408: a2008e7852bd8652 38f
4410: a0de205945ce7d52 3d9
4418: ad7d52c900d01aa9 3d8
4420: 018d7d52ae7952e8 3be
4428: e006d002a2008e79 361
4430: 52bd9052a0df2059 3e9
4438: 4560a200ad5b4449 2dc
4440: 008d5b448d5e44c9 3a4
4448: 00d00fee5c44ad5c 376
4450: 44c918d005a9108d 340
4458: 5c44bd00109d003f 249
4460: e8e080d0f560a200 50f
4468: bd70529d6c52e6e0 4a2
4470: 04d0f5a91f8d4841 3a7
4478: 60a200a9009d6c52 306
4480: e8e004d0f8851385 4b1
4488: 73850e8510850460 284
4490: a200bd96529d0470 358
4498: 9d00d4e6e019d0f2 514
44a0: a9008d217060a9fa 3ca
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5358  a900851320d75320 2a[illegible]
5360  0f5420a64420b653 24[illegible]
5368  4cbc53a9b885fb85 4c[illegible]
5370  fda90585fca9d985 53[illegible]
5378  fea9078d0170ee9a 43[illegible]
5380  46a24ba000ea91a20 2c[illegible]
5388  9546207e46207e46 2a[illegible]
5390  a9078d0170a00aa2 2f[illegible]
5398  00a923209546207e 26[illegible]
53a0  46207e46a00aa219 28[illegible]
53a8  209846a00aa22220 29[illegible]
53b0  7e46207e46209846 2a[illegible]
53b8  ce9a4660a9008512 34[illegible]
53c0  209855a901851185 2c[illegible]
53c8  10a20120bd46a512 28[illegible]
53d0  c9ffd0f54cf04aa2 5e[illegible]
53d8  008a951be8e000d0 3d[illegible]
53e0  f9a90185238524a2 39[illegible]
53e8  00207061a901a220 25[illegible]
53f0  207061a900852fa9 2f[illegible]
53f8  00853385258526a9 2b[illegible]
5400  3285278528a90585 2b[illegible]
5408  29852a206b55e0a9 2c[illegible]
5410  9320d2ffa90e8d21 3e[illegible]
5418  d0a9098d22d0a900 3a[illegible]
5420  85fe85faa90485fc 53[illegible]
5428  a9d885fea9078d01 44[illegible]
5430  70a299a001a90020 32[illegible]
5438  9546a01da205a927 3b[illegible]
5440  209546a9098d0170 2a[illegible]
5448  a00ba2a3a91a2095 36[illegible]
```

To be continued.


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TOP★ TIPS

MEMORY LOOK

To enable the contents of the memory holding a Basic program to be examined I have written the following utility which uses line numbers from 9000 onwards. This allows it to be added to the end of existing programs using Merge "" instead of Load "".

Once installed the direct command Go To 9000 should be used to execute the routine. The screen is filled with the memory locations, the corresponding contents in decimal and where applicable the ASCII character or keyword.

The "scroll?" prompt appears after each screen fill and allows you to stop by pressing key N.

Alan Pratt

```
9000 REM Examine memory
9010 CLS : LET i=PEEK 23635+PEEK 23636*256-1: GO TO 9210
9020 LET p=PEEK i
9030 IF p=13 THEN GO TO 9200
9040 IF p=14 THEN GO TO 9300
9050 IF p<10 THEN PRINT i;"  ";p
9060 IF p>9 AND p<100 THEN PRINT i;"  ";p;"  ";
9070 IF p>99 THEN PRINT i;"  ";p
9080 IF p<31 THEN PRINT PAPER 5;CHR$ p
9090 IF p>32 THEN PRINT
9100 LET i=i+1: GO TO 9020
9200 PRINT i;"  ";p;"   "; PAPER 4;"End of Line"
9210 LET i=i+1: LET l=PEEK i*256+PEEK (i+1)
9220 PRINT i;"  "; PAPER 6;"Line No. ";l
9230 LET i=i+2: LET b=PEEK i+PEEK (i+1)*256
9240 PRINT i;"  "; PAPER 6;"No. of bytes = ";b
9250 LET i=i+1: GO TO 9100
9300 PRINT i;"  ";p;"   "; PAPER 4;"Number held as"
9310 PRINT i+1;
9320 FOR j=i+1 TO i+5
9330 PRINT PEEK j;" ";
9340 NEXT j
9350 PRINT : LET i=i+5: GO TO 9100
```

HEX-DEC/DEC-HEX

This is a machine-code program which is for the CBM 64 and readily converts either hexadecimal to decimal or decimal to hexadecimal.

To do this you simply type the following:

for dec/hex
SYS 49152,***** (decimal number)
for hex/dec
SYS 49242,$**** (hexadecimal number)

Gary Taylor

```
30000 REM HEX-DEC & DEC-HEX
30010 ADD=49152:C=0
30020 READ A:IF A<0 THEN END
30030 POKE ADD+C,A:C=C+1:GOTO 30020
30040 DATA 32,253,174,32,138,173,32,247,183,170,152,72,72,138,72,72
30050 DATA 169,36,32,210,255,104,32,30,192,104,32,43,192,104,32,30
30060 DATA 192,104,32,43,192,96,24,106,106,106,106,41,15,24,105,48
30070 DATA 201,58,144,2,105,6,32,210,255,96,234,234,234,32,115,0
30080 DATA 201,58,41,15,144,2,105,8,96,32,61,192,10,10,10,10
30090 DATA 133,35,32,61,192,101,35,133,35,96,32,115,0,201,36,240
30100 DATA 3,76,8,175,32,73,192,133,34,32,73,192,165,34,166,35
30110 DATA 32,205,189,76,116,164,234,234,-1
```

RESPONSE *Frame*

Do you have a problem related to your micro? Tim Hartnell will do his best to help. Please include only one question per letter and mark it "Response Frame". Alternatively, perhaps you have an idea you'd like to pass on to others. Why not write to us with your top tips?

BBC FILL-IN

■ I have owned my BBC Model B computer for over eight months and have not experienced any problems with it until now. I discovered the problem when I accidentally used a recently-obtained "fill" routine on a screen full of text. When the routine encounters the text, the computer locks up, and I have to resort to the Break key, or it produces a variety of very strange error messages, depending on which graphic mode it is used in. The "fill" routine uses the Point command and it is the lines which contact this command which produce the error messages. To start the routine, I used the command Procfill (500,500). I would be pleased if you could tell me if the fault is in the programming, if it is a universal fault in all PS 1.2's or if it is just my computer at fault. Here is the offending program:

```
10 DEFPROCFILL (X%, Y%)
20 CLEAR
30 X=X%:Y=Y%
40 IF POINT (X,Y)=0 THEN PLOT 69,X%,Y%
50 IF POINT ((X+4),Y)=0 THEN PROCFILL ((X+4),Y)
60 IF POINT (X,(Y+4))=0 THEN PROCFILL (X,(Y+4))
70 IF POINT ((X-4),Y)=0 THEN PROCFILL ((X-4),Y)
80 IF POINT (X,(Y-4))=0 THEN PROCFILL (X,(Y-4))
```

Darren Powell,
Thorne,
Doncaster.

THE PROBLEM lies in the program, not in the operating system or your computer. For a start, you should not use Clear within a procedure as this strips the return address for exiting the procedure from the stack, so it can return to almost anywhere in the program.

The BBC Micro generates meaningless random error messages under certain circumstances, so the content of the messages you have generated is irrelevant. Your routine, even without the Clear, is probably the least sophisticated "fill" routine possible. As it is recursive, it is also very, very memory-hungry.

It probably consumes around 60 bytes every time it calls itself. When you try to "fill" on a page of text, more than half the screen is blank, so the number of self-calls will be huge, giving rise to the problems you've experienced. I suggest you delete the Clear, and only use your routine for filling relatively small shapes.

COLOURED MAN

■ I have an Amstrad computer and am presently writing a program in Mode 1. I want to include a figure of a man, made up of five user-defined graphic shapes. However, I want to mix colours within particular defined graphics and cannot figure out how to do this. Can it be done?

M Smith,
Stoke-on-Trent.

MODE 1, AS you know, gives four colours but there is no way in Basic which I can discover which will allow more than one colour to be used for a user-defined graphic. Although this would doubtless produce a program which ran more slowly, you could user Line and Draw to construct your figure as these do allow you to do colour changes.

WHICH MODEM?

■ I am looking for help on the subject of modems for the Electron. I am interested in buying one, but am not sure which are available.

Richard Rennie,
West Calder,
West Lothian.

I HAVE BEEN unable to locate any modems made specifically for the Electron. If you get an RS-423 interface for your Electron, you will then be able to hook your computer to any modem made for the BBC. In fact, with this interface, you'll probably be able to use any standard 1200 baud modem.

CBM-64 SOUND

■ In a recent edition of *Your Computer* magazine I saw an advertisement for a "digital sound sampler" for the ZX Spectrum. I own a Commodore 64, and wonder if there are similar products available for it?

Stewart Sadler,
Tollesbury.

WHILE I have not been able to track down a sound sampler as such, I've discovered that many of the music synthesiser programs available for the 64 give you the capability of generating many non-musical sounds. The *Commodore Music Maker*, which you might have seen, includes a small keyboard which actually sits on the Commodore's keys, and comes with driver software. If you want to generate speech, the cassette program from an American company, *Big-Mouth*, is available. There is also the plug-in speech module from Commodore called *Magic Voice*.

VIC DISC DRIVE

■ I am a Vic-20 owner, and after a couple of years' computing I now wish to invest in a disc drive. The obvious choice is the Commodore drive, but this is fairly expensive.

Andrew McFarlane,
Sheffield.

THE EASIEST route to follow is to buy an RS-232 interface for your Vic-20, which will give you the ability to choose from a very wide range of disc drives — and, incidentally, other peripherals as well.

AMSTRAD COLOUR

■ I am considering buying an Amstrad CPC-464. However, there is one thing I have not been able to find out from the articles which have been printed on it. If I buy a green-screen monitor version, can I plug the computer into a colour television? If I can, will it produce a colour picture, or is the "colour circuitry" only provided with the colour version?

Anthony Hodgson,
Sunderland.

THERE IS only one type of Amstrad machine, in terms of its ability to produce a colour picture. The only difference is in the monitor provided with the one you buy. You cannot connect the CPC-464 up directly to a colour television. However, Amstrad make a modulator, costing around £30, for this purpose.

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50-way	95	£1.25
60-way	£1.10	£1.40
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Dodgems

Spectrum

Julian Wood,
Downham Market,
Norfolk.

YOU CONTROL a white car running around a track of five lanes, trying to collect the yellow dots while avoiding the red computer-controlled car. Every so often the red car will drop a steering wheel — worth 50 points when collected. However, if you aren't quick enough, the red car will pick it up again. A dot is worth five points.

To make the game slightly more difficult, you have a limited amount of fuel. Once your fuel has run out, your car stops and it is only a matter of time before the red car crashes into you. When you crash you lose one of your three lives and when you have lost all your lives, a short tune is played, the game ends and you are invited to have another go. There is a high-score facility.

The amount of fuel changes from 500 to 400 to 300 units with each level completed. After three levels you receive a bonus number of points, the fuel returns to 500 units and the game becomes slightly harder. A level is completed when all the dots have been collected. At the beginning of each level, and also when you receive a bonus, the computer plays a short tune.

To enter Dodgems, first type in the Basic program in listing 1. Then enter a line 1 Rem followed by the letter "a" 384 times — or 12 lines' worth. This is used to hold the machine code. Then Run 9990 and carefully enter the decimal values in listing 2. In the left-hand column are the addresses and on the right-hand side, in brackets, are the addresses and on the right-hand side, in brackets, are the checksum values. If you make a mistake, enter −1 and enter that line again.

After entering a line of five numbers, check the checksum value before entering the next line. When you have finished entering the machine code and are sure that everything is correct, delete lines 9990-9995 and save the program using

SAVE "DODGEMS" LINE 15

When the program is run, there is a short pause while the user-defined graphics are set up and then the game starts. I moves your car in a lane, O moves it out a lane. You can move in or out up to two lanes at once, as can the red car.

The program uses four machine code subroutines:

23760—prints a certain number of dots used in setting up the display
23807—the explosion sound-effects routine
23848—moves the white car, and also decreases and prints amount of fuel
24011—moves the red car

The routines use two Rom subroutines:

8141—executes a #2, thus allowing printing in the upper half of the screen #n can also be achieved by: LD A,n: CALL 8143
6683—prints a decimal number in the range 0-9999.

Listing 1.

```
  15 RESTORE 20: FOR a=USR "a" TO USR "o"-1: READ b: POKE a,b: NEXT a
  20 DATA 0,0,0,7,15,28,24,24,0,0,0,255,255,0,0,0,24,24,24,24,24,24,24,24
  30 DATA 0,0,0,224,240,56,24,24,24,24,56,240,224,0,0,0,24,24,28,15,7,0,0,0
  40 DATA 189,255,189,60,24,153,255,153,231,66,242,255,255,242,66,231,0,0,0,24,24,0,0,0
  50 DATA 231,66,79,255,255,79,66,231,153,255,153,24,60,189,255,189,137,82,85,62,188,90,42,201,24,24,255,255,24,24,24,24
  55 DATA 126,195,165,153,153,165,195,126
  60 DATA .2,-10,50,5,.2,-10,.5,-5,.2,-10,50,5,.2,-10,.5,-3
  65 DATA .2,-10,50,5,.2,-10,.15,-1,.15,0,.15,-1,.15,-3,.15,-1,.15,-3,1,-5
  80 DATA .4,0,50,1,.4,-5,.2,4,50,1,.2,4,50,1,.2,4,50,1,.2,4,.1,2,.3,0,1,-1
  90 DATA .1,-5,.1,-5,.3,4,.3,-5,.3,4,.7,-5,.7,4,1,-5
 190 LET hi=0
 200 LET le=1: LET li=3: LET h=2: LET s=0
 205 FOR m=500 TO 300 STEP -100
 210 LET p=0: GO SUB 1000: PRINT #1;" SCORE: ";s,TAB 16;"HIGH: ";hi
 211 LET f=m: PRINT AT 7,23;"FUEL: ";f;AT 12,23;"LIVES: ";li
 212 PRINT AT 9,9; INK 7;"H";AT 9,12; BRIGHT 1; INK 2;"H"
 213 LET d=6: LET l=5: LET l1=5
 214 RESTORE 60: LET r=INT (RND*15): FOR a=1 TO 18: READ b,c: IF b=50 THEN PAUSE c: GO TO 216
 215 BEEP b,c+r
 216 NEXT a: LET ts=0: LET x=9: LET y=x: LET xr=12: LET yr=x: RANDOMIZE
 220 LET ch=152: LET x1=x: LET y1=y: LET xr1=xr: LET yr1=yr: IF NOT f THEN GO TO 350
 225 LET o=l: LET a$=INKEY$
 230 IF y>9 AND y<12 THEN LET x=x+2*(x<9 AND a$="i" OR x>11 AND x<20 AND a$="o")-2*(x>12 AND a$="i" OR x>1 AND x<10 AND a$="o"): IF x<>x1 THEN LET ch=ch+x-x1: LET l=l+(a$="i")-(a$="o")
 240 IF x>9 AND x<12 THEN LET y=y+2*(y<9 AND a$="i" OR y>11 AND y<20 AND a$="o")-2*(y>12 AND a$="i" OR y>1 AND y<10 AND a$="o"): IF y<>y1 THEN LET ch=ch+2*(y-y1): LET l=l+(a$="i")-(a$="o")
 310 LET a=USR 23848
 320 IF a=6 THEN LET s=s+5: LET ts=ts+1: BEEP .005,0: IF ts=179 THEN GO TO 510
 330 IF a=5 THEN LET s=s+50: BEEP .1,20
 340 PRINT #1;AT 1,7;s
 350 IF x=xr AND y=yr THEN GO TO 1100
 360 LET ch=152: IF RND*h<=1 THEN GO TO 450
 380 LET a=(l1<l)-(l1>l)
 385 IF l<l1 AND o=l1 OR p THEN LET p=NOT p: GO TO 450
 390 IF yr>9 AND yr<12 THEN LET xr=xr+2*(xr<9 AND a=1 OR xr>11 AND xr<20 AND a=-1)-2*(xr>12 AND a=1 OR xr>1 AND xr<10 AND a=-1): IF xr<>xr1 THEN LET ch=ch+xr-xr1: LET l1=l1+a
 400 IF xr>9 AND xr<12 THEN LET yr=yr+2*(yr<9 AND a=1 OR yr>11 AND yr<20 AND a=-1)-2*(yr>12 AND a=1 OR yr>1 AND yr<10 AND a=-1): IF yr<>yr1 THEN LET ch=ch+2*(yr-yr1): LET l1=l1+a
 450 LET a=USR 24011: IF NOT a AND RND>.99 THEN LET d=5
 500 GO TO 220
 510 FOR a=0 TO 100: NEXT a: LET le=le+1: NEXT m: LET h=h+h
 520 BORDER 1: PAPER 7: CLS : PRINT AT 5,9; INK 0; FLASH 1;" WELL DONE! ";AT 8,6;" BONUS ";250*le/4;" POINTS "
 530 LET s=s+250*le/4: RESTORE 80: FOR a=1 TO 31: READ b,c: IF b=50 THEN PAUSE c: GO TO 550
 540 BEEP b,c+r
 550 NEXT a: PRINT #1; FLASH 1;"  PRESS ANY KEY TO CONTINUE",
 555 IF INKEY$<>"" THEN GO TO 555
 557 IF INKEY$="" THEN GO TO 557
 560 GO TO 205
1000 BORDER 0: PAPER 0: CLS : PRINT USR 23760: INK 4
1015 PRINT INK 0;AT 10,0;,,;: PRINT AT 0,10;"——";AT 21,10;"——";AT 10,0;"|";AT 10,21;"|""|";AT 11,21;"|"
1030 FOR a=0 TO 10 STEP 2: PRINT AT a,a;"r";AT a,21-a;"ɿ": FOR b=a+1 TO 9: PRINT AT a,21-b;"—";AT a,b;"—";AT b,a;"|";AT b,21-a;"|": NEXT b
1040 PRINT AT 21-a,a;"L";AT 21-a,21-a;"ɹ": FOR b=12 TO 20-a: PRINT AT 21-a,b;"—";AT 21-a,21-b;"—";AT b,a;"|";AT b,21-a;"|": NEXT b: NEXT a
1045 INK 7: PRINT AT 2,23;"LEVEL ";le
1050 RETURN
1100 PRINT AT y,x; FLASH 1; BRIGHT 1; INK 2; PAPER 6;"X": IF USR 23807 THEN LET li=li-1
1105 DATA .6,0,.6,0,.1,0,.6,0,.5,3,.1,3,.3,2,.3,0,.3,0,.3,-1,1,0
1110 IF li THEN GO TO 210
1120 BORDER 2: PRINT INK 2;AT y,x;"+": RESTORE 1105: FOR a=1 TO 11: READ b,c: BEEP b,c+r: NEXT a
1125 IF s>hi THEN LET hi=s: PRINT #1; FLASH 1; INK 7; PAPER 0;AT 1,21;hi
1130 BORDER 0: PRINT AT 17,23; FLASH 1;"PRESS ANY";AT 18,23;" KEY FOR ";AT 19,23;" ANOTHER ";AT 20,23;"  GAME  "
1135 IF INKEY$<>"" THEN GO TO 1135
1137 IF INKEY$="" THEN GO TO 1137
1140 CLS : GO TO 200
9990 LET c=0: FOR a=23760 TO 24144 STEP 5: LET p=c
9991 PRINT a;"-";: FOR b=0 TO 4
9992 INPUT d: IF d=-1 THEN LET c=p: PRINT : LET a=a-5*NOT b: GO TO 9991
9994 IF d<0 OR d>255 THEN BEEP .5,-10: GO TO 9992
9995 POKE a+b,d: LET c=c+d: PRINT TAB 6+b*4;d;: NEXT b: PRINT TAB 25;"(";c;")": NEXT a
```

Listing 2.

```
23760-205  205  31   14   0   (455)
23765-62   16   215  62   6   (816)
23770-215  6    21   62   152 (1272)
23775-215  16   251  62   16  (1832)
23780-215  175  215  62   22  (2521)
23785-215  121  215  62   10  (3144)
23790-215  62   32   215  62  (3730)
23795-32   215  62   13   215 (4267)
23800-12   62   21   185  32  (4579)
23805-215  201  6    10   33  (5044)
23810-0    0    126  211  254 (5635)
23815-35   124  254  64   32  (6144)
23820-247  16   242  201  229 (7079)
23825-213  68   77   33   0   (7470)
23830-0    17   32   0    25  (7544)
23835-16   253  9    1    0   (7823)
23840-88   9    126  209  225 (8480)
23845-254  4    201  221  42  (9202)
23850-75   92   1    74   0   (9444)
23855-221  9    221  78   25  (9998)
23860-221  70   26   11   221 (10547)
23865-113  25   221  112  26  (11044)
23870-62   16   215  62   7   (11406)
23875-215  62   22   215  62  (11982)
23880-7    215  62   28   215 (12509)
23885-205  27   26   62   6   (12835)
23890-215  221  94   103  221 (13889)
23895-86   110  221  110  69  (14285)
23900-221  102  75   62   9   (14754)
23905-188  56   7    44   205 (15254)
23910-16   93   32   43   45  (15483)
23915-62   11   188  48   7   (15799)
23920-45   205  16   93   32  (16190)
23925-1    44   62   11   187 (16495)
23930-48   10   36   229  107 (16925)
23935-205  16   93   225  32  (17496)
23940-16   37   62   9    187 (17807)
23945-56   10   37   229  107 (18246)
23950-205  16   93   225  32  (18817)
23955-1    36   221  117  69  (19261)
23960-221  116  75   205  16  (19894)
23965-93   79   62   16   215 (20359)
23970-175  215  62   22   215 (21048)
23975-122  215  123  215  62  (21785)
23980-32   215  62   16   215 (22325)
23985-62   7    215  62   22  (22693)
23990-215  124  215  125  215 (23587)
23995-221  126  96   131  149 (24310)
24000-245  122  140  71   241 (25137)
24005-128  128  215  6    0   (25614)
```

(continued on next page)

SOFTWARE File

(continued from previous page)

```
24010-201 205 205 31  221(26477)   24075-9   187 56  10  36 (31908)
24015-42  75  92  1   74 (26761)   24080-229 187 208 16  93 (32558)
24020-0   221 9   221 94 (27306)   24085-225 32  1   37  221(33074)
24025-118 221 86  126 221(28078)   24090-117 82  221 116 89 (33609)
24030-110 82  221 102 89 (28682)   24095-205 16  93  79  62 (34154)
24035-62  9   188 56  7  (29004)   24100-16  215 221 126 31 (34763)
24040-45  205 16  93  32 (29395)   24105-245 215 62  22  215(35522)
24045-43  44  62  11  158(29743)   24110-122 215 123 215 241(36438)
24050-48  7   44  205 16 (30063)   24115-254 5   62  152 32 (36943)
24055-93  32  1   45  62 (30296)   24120-2   62  157 215 62 (37441)
24060-11  187 48  10  37 (30589)   24125-16  215 62  2   215(37981)
24065-229 187 205 16  93 (31239)   24130-221 54  31  0   62 (38319)
24070-225 32  16  36  62 (31618)   24135-6   185 32  3   221(38766)
                                   24140-113 31  195 180 93 (39378)
```

Carnival Shootout

Tony Loton,
Stoke-on-Trent,
Staffordshire.

Amstrad

CARNIVAL SHOOTOUT is an arcade-style game for the Amstrad CPC-464. It is about 6K long and is written partly in Basic and partly in machine code. Typing the data in wrongly could cause the program to crash so it is best to save the program on tape before running

```
10 ENV 1,15,1,1:ENT 1,15,1,1:ENV 2,15,-1,1:RESTORE
20 REM CARNIVAL
30 FOR I=38500 TO 38546:READ A:POKE I,A:NEXT
40 DATA 221 , 126 , 0 , 38 , 0 , 61 , 111 ,205 , 26 ,
188 , 6 , 8 , 125 , 50 , 44 , 151 , 124 , 50 , 45 , 15
1 , 126 , 84 , 93 , 35 , 197 , 1 , 79 , 0 , 237 , 176
, 193 , 43 , 119 , 58 , 45 , 151 , 103 , 58 , 44 , 151
 , 111 , 205 , 38 , 188 ,  16,222,201
50 FOR I=38400 TO 38451:READ A:POKE I,A:NEXT
60 DATA 221,126,0,38,0,61,111,205,26,188,6,8,125,50,44
,151,124,50,45,151,17,79,0,237,90,126,84,93,43,197 , 1
 , 79 , 0 , 237 , 184 , 193 ,   35 , 119 , 58 , 45 ,
151 , 103 , 58 ,   44 , 151 , 111 , 205 , 38 , 188 , 1
6 ,  217 , 201
70 FOR I=39000 TO 39073:READ A:POKE I,A:NEXT
80 DATA 17 , 64 , 156 , 221 , 110 , 0 , 221 ,   35 , 2
21 , 102 , 0 , 237 , 90 , 68 ,    77 , 197 , 221 , 35
, 221 , 110 , 0 ,   221 , 35 , 221 , 102 , 0 , 17 , 0
, 0 , 205 , 29 , 188 , 193 , 221 , 35 , 221
90 DATA 94 , 0 , 221 , 35 , 221 , 86 , 0 , 237 , 90 ,
89 , 80 , 6 , 4 , 14 , 16 , 26 ,  119 , 19 , 35 , 16 ,
 250 , 6 , 4 , 43 , 43 , 43 , 43 , 205 , 38 , 188 , 13
 ,   62 , 0 , 185 , 194 , 139 , 152 , 201
100 SYMBOL AFTER 97:SYMBOL 97,0,0,48,88,248,184,4,28:S
YMBOL 98,28,28,14,7,61,88,36,8:SYMBOL 99,0,0,0,0,0,0,5
6,96:SYMBOL 100,96,96,112,120,0,0,0,0
110 SYMBOL 101,0,0,12,26,31,29,32,56:SYMBOL 102,56,56,
112,224,188,26,36,16:SYMBOL 103,0,0,0,0,0,0,28,6:SYMBO
L 104,6,6,14,30,0,0,0,0
120 SYMBOL 105,0,48,16,48,32,32,65,126:SYMBOL 106,127,
126,127,126,60,0,0,0:SYMBOL 107,0,128;64,64,128,0,0,0:
SYMBOL 108,0,0,0,0,0,8,8,24
130 FOR I=40000 TO 40063:READ A:POKE I,A:NEXT
140 DATA 0,48,0,0,0,16,0,0,0,16,0,0,0,16,0,0,0,16,0,0,
0,16,0,0,0,16,0,0,0,16,0,0,0,16,0,0,0,16,0,0,0,16,32,0
,0,16,16,0,0,16,16,0,0,48,16,0,0,48,48,48,16,16,48,48
150 FOR I=40064 TO 40127:READ A:POKE I,A:NEXT
160 DATA 0,0,0,0,0,0,0,0,0,80,0,0,0,80,0,0,0,240,160,0
,0,240,160,0,0,240,160,0,0,240,160,0,0,240,160,0,0,240
,160,0,0,240,160,0,0,240,160,0,0,80,0,0,0,80,0,0,0,240
,160,0,0,240,160,0
170 SC%=0:GOSUB 520
180 MODE 0:PAPER 0:CLS:INK 0,3:BORDER 3:INK 1,0:INK 2,
26:INK 3,20:INK 4,2:INK 5,0:INK 6,1:INK 7,24:INK 15,18
,9
190 SH%=0:FOR i=41000 TO 41063:POKE i,0:NEXT
200 SL=38500:SR=38400:SPRITE=39000
210 PEN 1:PRINT:PRINT:PRINT "a a a a a a a a a a b b b
 b b b b b b b":PRINT CHR$(22)+CHR$(1):PEN 2:LOCATE 1,
3:PRINT"c c c c c c c c c c d d d d d d d d d d":PRINT
 CHR$(22)+CHR$(0)
220 PEN 6:PRINT:PRINT " e e e e e e e e e e f f f f f
f f f f f":PRINT CHR$(22)+CHR$(1):LOCATE 1,7:PEN 2:PRI
NT" g g g g g g g g g g h h h h h h h h h h":PRINT CHR
$(22)+CHR$(0)
230 PEN 7:PRINT "i i i i i i i i i i j j j j j j j j j
 j":PRINT CHR$(22)+CHR$(1):PEN 2:LOCATE 1,11:PRINT"k k
 k k k k k k k k l l l l l l l l l l":PRINT CHR$(22)+C
HR$(0)
240 LOCATE 1,25:PEN 3:PRINT" CARNIVAL SHOOTOUT";
250 X%=40:PEN 15:B%=35
260 CALL SL,3:CALL SL,4:CALL SR,7:CALL SR,8:CALL SL,11
:CALL SL,12
270 IF INKEY(71)=0 AND F=0 AND X%>0 THEN GOSUB 330:X%=
X%-2
280 IF INKEY(63)=0 AND F=0 AND X%<72 THEN GOSUB 330:X%
=X%+2
290 IF INKEY(47)=0 AND F=0 THEN F=1:Y%=7:BX%=X%:SOUND
2,0,0,15,2,0,10:B%=B%-1:LOCATE 9,1:PRINT B%:IF B%<0 TH
EN 440
300 CALL SPRITE,X%,23,0
310 IF F>0 THEN GOSUB 350
320 GOTO 260
330 CALL SPRITE,X%,23,1000
340 RETURN
350 Y%=Y%+32:IF Y%>190 THEN F=0:CALL SPRITE,BX%,Y%-32,
1000:RETURN
360 IF Y%>39 THEN CALL SPRITE,BX%,Y%-32,1000 ELSE CALL
 SPRITE,BX%,Y%-16,1000
370 CALL SPRITE,BX%,Y%,64
380 IF TEST(X%*8+14,Y%*2+10)<>0 THEN 400
390 RETURN
400 CALL SPRITE,BX%-2,Y%+16,1000:CALL SPRITE,BX%+2,Y%+
16,1000:SH%=SH%+1:SC%=SC%+RND*10+10
410 SOUND 1,60,0,0,1,1:F=0:CALL SPRITE,X%,Y%,1000
420 IF SH%=30 THEN 480
430 RETURN
440 CLS:PEN 1:PRINT "YOU RAN OUT OF       BULLETS."
450 PRINT:PRINT"YOU SCORED:";SC%
460 PRINT:PRINT" HIT ENTER TO PLAY"
470 IF INKEY(18)<>0 THEN 470 ELSE RUN
480 CLS:PEN 1:PRINT"YOU SHOT ALL THE     TARGETS 'WELL
DONE!"
490 PRINT:PRINT "YOU SCORED:";SC%
500 PRINT:PRINT "PRESS ENTER TO      CARRY ON."
510 IF INKEY(18)<>0 THEN 510 ELSE GOTO 180
520 MODE 1:PAPER 0:CLS:INK 0,3:BORDER 3:INK 1,0:INK 2,
26:INK 3,18:ENV 5,30,0,2,1,-15,1
530 PEN 1:PRINT "a a a a a a a a a a a a a a a a a a a
 a b b b b b b b b b b b b b b b b b b b b":PRINT CHR$
(22)+CHR$(1):PEN 2:LOCATE 1,1:PRINT"c c c c c c c c c
c c c c c c c c c c c d d d d d d d d d d d d d d d d
d d d d""
540 PEN 3:PRINT "           CARNIVAL SHOOTOUT"
550 PEN 1:PRINT"e e e e e e e e e e e e e e e e e e e
e f f f f f f f f f f f f f f f f f f f f":PEN 2:LOCAT
E 1,4:PRINT"g g g g g g g g g g g g g g g g g g g g h
h h h h h h h h h h h h h h h h h h h"
560 PRINT CHR$(22)+CHR$(0)
570 PEN 3:PRINT:PRINT"YOU HAVE TO SHOOT AS MANY OF THE
 MOVING TARGETS AS POSSIBLE. THERE ARE 30 TO HITAND YO
U ONLY HAVE 35 BULLETS SO AIM WITHCARE."
575 PRINT:PRINT "THE NUMBER OF BULLETS YOU HAVE LEFT I
S  SHOWN AT THE TOP OF THE SCREEN."
580 PEN 2:PRINT:PRINT "KEYS TO USE:-
                         Z-LEFT  X-RIGHT
            SPACE-SHOOT"
590 PAPER 1:PEN 0:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT"
             HIT ENTER TO START           "
600 SL=38500:SR=38400:RESTORE 640
610 CALL SL,1:CALL SL,2:CALL SR,4:CALL SR,5
620 READ N,D:IF N=-1 THEN RESTORE 640 ELSE SOUND 4,N,D
*6,15,5
630 IF INKEY(18)=0 THEN RESTORE:RETURN ELSE 610
640 DATA 95,4,106,4,119,4,106,4,95,8,106,2,119,2,127,2
,142,4,159,4,142,4,127,8,142,2,159,2,179,2,190,4,159,4
,119,4,127,4,106,4,80,4,95,16
650 DATA 95,4,106,4,119,4,106,4,95,8,106,2,119,2,127,2
,142,4,159,4,142,4,127,8,142,2,159,2,179,2,190,4,159,4
,119,4,127,4,106,4,80,4,119,16,-1,-1
```

Colours

A D Grundy,
Merton,
London.

Spectrum

THE PROGRAM sets out to prove that the Spectrum can show more than the usual eight colours. It does this by picking up the letter to be displayed and subtracting it byte by byte from the sprite graphic.

```
5002 LET k$="1234567": LET i$="6
260056": LET p$="1702332": FOR m
=1 TO 7
5004 LET high=VAL k$(m TO m): LE
T ink=VAL i$(m TO m): LET paper=
VAL p$(m TO m)
5006 LET z=0: GO SUB 9400: GO SU
B 9500: PRINT INK ink; PAPER pap
er;AT high,1;"A";" ink ";ink;" p
aper ";paper
5008 NEXT m
6000 INPUT "If Colour ok press Y
 ";y$: IF y$="y" OR y$="Y" THEN
LET ink=6: LET paper=1: GO TO 70
00
6010 INPUT "ink ";ink: INPUT "pa
per ";paper
7000 REM show line l$
7010 CLS : INK ink: PAPER paper:
 LET l$=" Press Y to show with i
nfill ."
7020 GO SUB 7200
7030 IF INKEY$="Y" OR INKEY$="y"
 THEN GO TO 7100
7040 GO SUB 7300: GO TO 7030
7050 REM **show pink text**
7100 FOR d=1 TO 30: LET z=8*(-32
+CODE l$(d TO d)): GO SUB 9400:
GO SUB 9500: GO SUB 9600: PRINT
AT 10,d;"A";AT 11,d;"B": NEXT d
```

```
GO TO 8800: REM
 show effect of filling in

7200 FOR d=1 TO 30: LET z=8*(-32
+CODE l$(d TO d)): GO SUB 9400:
GO SUB 9500: PRINT AT 10,d;"A";A
T 11,d;"B": NEXT d: RETURN : REM
 show line of print

7300 FOR f=2 TO 30: BEEP .25,((C
ODE l$(f TO f))/4): NEXT f: RETU
RN : REM make a noise

8800 REM ** BIG LETTERS **

8810 BORDER 1: FOR g=0 TO 10: IN
K RND*3: PAPER 7-RND*3
8820 INPUT " LETTER ";h$: LET z=
8*(-32+CODE h$)
8825 GO SUB 9400
8830 GO SUB 9500
8840 GO SUB 9600
8850 FOR e=0 TO 21 STEP 2: PRINT
 AT e,0;"AAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAA";AT 1+e,0;"BBBBBBBBBBB
BBBBBBBBBBBBBBBBBBBBB"
8860 NEXT e: IF h$=" " THEN GO T
O 5000
8870 NEXT g
8880 GO TO 5000

9000 REM *big*

9400 FOR f=1 TO 7 STEP 2: POKE 6
5368+f,0: POKE 65368+8+f,0: NEXT
 f: RETURN : REM stripe Graphic

9500 FOR f=0 TO 7: POKE (65368+2
*f),255-PEEK (15616+f+z): NEXT f
: RETURN : REM get alpha-numeric

9600 FOR f=0 TO 7: POKE (65369+2
*f),0.5*PEEK (15616+f+z): NEXT f
: RETURN : REM half infill
```

Dominoes

J Ireland,
Canterbury,
Kent.

Vic-20

DOMINOES NEEDS a minimum 8K expansion. There are three variations on the game against the computer. All instructions are included with the game.

There are three versions. Block, Draw and Bergen. Each version has slightly different rules for scoring. In Block, or Draw you lose points for what is in your hand at the end. In Bergen you gain points for matching ends of chains.

```
READY.

10 PRINT"■":POKE36879,25
20 DIMA%(28,1),P%(28,1),C%(28,1),CP%(6)
30 D$="■■■■■■■■":CL$="                    ":C1$=CL$+CL$+CL$+CL$+CL$+CL$:D1$=D$+CL
$
40 PL=4326:CO=33792:PR=PL+1:IL=-1:IR=1:TP=PL-158
50 CL=0:CR=6:LL=0:RL=0:PA=0:LD=0:RD=0:SD=0:K1=-1:K2=K1
60 IFNGTHEN140
70 PRINT"■■■■■■■■■■■■1 BLOCK":PRINT"■■■■■■■2 DRAW":PRINT"■■■■■■■3 BERGEN"
80 PRINT"■■■■■■■■SELECT GAME"
90 GETA$:IFA$<"1"ORA$>"3"THEN90
100 G=VAL(A$):PRINT"■■■INSTRUCTIONS? (Y/N)"
110 GETA$:IFA$="Y"THEN2410
120 IFA$<>"N"THEN110
130 PRINT"■"
140 GT=-50*(G=1)-100*(G=2)-15*(G=3):PT=-6*(G=3)-7*(G<3):CT=PT
150 IFNGTHEN170
160 NG=1:C=1:FORA=0TO6:FORB=ATO6:A%(C,0)=A:A%(C,1)=B:C=C+1:NEXTB,A
169 REM **SHUFFLE TILES**
170 FORJ=28TO2STEP-1
180 I=INT(RND(1)*(J-1))+1:A=A%(I,0):B=A%(I,1)
190 A%(I,0)=A%(J,0):A%(I,1)=A%(J,1):A%(J,0)=A:A%(J,1)=B
200 NEXTJ
210 J=28:FORI=1TOPT:P%(I,0)=A%(J,0):P%(I,1)=A%(J,1):J=J-1
220 C%(I,0)=A%(J,0):C%(I,1)=A%(J,1):J=J-1:NEXTI:BY=J
230 IFG=3THEN390
240 IFG=2THENPRINT"■"TAB(9)"■■DRAW":GOTO260
250 PRINT"■"TAB(8)"■■BLOCK"
260 IFDGTHEN360
270 PRINT"■■WE'LL DRAW TO START":FORI=1TO2000:NEXT
280 A=INT(RND(1)*28)+1
290 B=INT(RND(1)*28)+1:IFA=BTHEN290
300 PRINT:PRINT"I DREW A  "A%(A,0)","A%(A,1)
310 PRINT:PRINT"YOU DREW A"A%(B,0)","A%(B,1):PRINT
320 I=A%(A,0)+A%(A,1):J=A%(B,0)+A%(B,1):IFI<>JTHEN340
330 PRINT"WE'LL HAVE TO REDRAW":FORI=1TO3000:NEXT:PRINT"■■■";:GOTO280
340 IFI>JTHENPRINT"I'LL START":WT=2:GOSUB600:GOSUB650:GOTO1530
350 PRINT"YOU START":WT=1:GOSUB600:GOSUB650:GOSUB770:GOTO670
360 PRINT"■■■■■■■■■■";
370 IFDG=1THENPRINT"YOU START.":WT=1:GOSUB600:GOSUB650:GOSUB770:GOTO670
380 PRINT"I START.":WT=2:GOSUB600:GOSUB650:GOTO1530
390 PRINT"■"TAB(8)"■■BERGEN"
400 PRINT"■■LOWEST DOUBLE STARTS":PRINT:FORI=1TO2000:NEXT
410 C=7:FORI=1TOPT:A=P%(I,0):B=P%(I,1)
420 IFA=BANDA<CTHENC=A:P1=I
430 NEXTI
440 D=7:FORI=1TOCT:A=C%(I,0):B=C%(I,1)
450 IFA=BANDA<DTHEND=A:C1=I
460 NEXTI
470 IFC=7ANDD=7THENPRINT"NO DOUBLE IN PLAY.....WE'LL START AGAIN"
480 IFC=7ANDD=7THENFORI=1TO2000:NEXT:GOTO150
490 IFC<DTHEN550
500 IFD=7THENPRINT"I HAVE NO DOUBLE":GOTO520
510 PRINT"I HAVE THE"C%(C1,0)","C%(C1,1)
520 PRINT"■YOU HAVE THE LOWEST   DOUBLE - THE"P%(P1,0)","P%(P1,1)
530 PRINT"■YOU START.":WT=1:F=P1:A=P%(F,0):B=A:FORI=1TO3000:NEXT
540 GOSUB600:GOSUB650:GOSUB850:RD=1:GOTO670
550 IFC=7THENPRINT"YOU HAVE NO DOUBLE":GOTO570
560 PRINT"YOU HAVE THE"P%(P1,0)","P%(P1,1)
570 PRINT"■I HAVE THE LOWEST     DOUBLE - THE"C%(C1,0)","C%(C1,1)
580 PRINT"■I'LL START.":WT=2:F=C1:A=C%(F,0):B=A:FORI=1TO3000:NEXT
590 GOSUB600:GOSUB650:DL=A:GOSUB1390:LD=1:GOTO2000
599 REM **SET UP PLAYING AREA**
600 FORI=1TO3000:NEXT:PRINT"■":X=PL-10:POKEX,36:POKEX+21,36
610 FORY=X+22TOX+9*22STEP22:POKEY,36:POKEY+10,36:POKEY+21,36:NEXTY
620 PRINT"■"C1$C1$"■■■ SCORE ■■■   TILES     ";
630 PRINT"■YOU■■■■■■■YOU■■■■■YARD":GOSUB1170
640 RETURN
650 IFG<3ANDWT=1THENRETURN
660 GOSUB1200:RETURN
670 BE=0:DG=0:IFWT=2THEN1530
679 REM **PLAYER'S TURN**
680 POKE198,0:PRINTD1$D$;:IFG=1OR(G=2ANDBY<2)OR(G=3AND(BY=0ORBE=1))THEN700
690 PRINT"■■■■PLAY OR ■■■DRAW?":GOTO710
700 PRINT"■■■■PLAY OR ■■■KNOCK?"
710 GETA$:IFA$<>"P"ANDA$<>"D"ANDA$<>"K"THEN710
720 IFA$<>"P"THEN750
730 GOSUB770:IFPT=0THEN2000
740 GOTO670
750 IFA$="D"THEN1040
760 GOTO1110
770 PRINTD1$D$"■WHICH DOMINO?";
780 GETA$:IFA$<"0"ORA$>"6"THEN780
790 PRINTA$",";
800 GETB$:IFB$<"0"ORB$>"6"THEN800
810 PRINTB$:A=VAL(A$):B=VAL(B$)
820 FORF=1TOPT:C=P%(F,0):D=P%(F,1):IF(C=AANDD=B)OR(C=BANDD=A)THEN850
830 NEXTF:PRINTD1$D$"YOU DON'T HAVE IT!":FORI=1TO2000:NEXT:IFSD=0THEN770
840 RETURN
850 IFSD=0THENGOSUB1250:DR=A:GOTO1010
860 IFA=DLORA=DRORB=DLORB=DRTHEN880
870 PRINTD1$D$"THAT WON'T MATCH!":FORI=1TO2000:NEXT:RETURN
880 IF(A=B)OR(DL=DRANDG<>3)ORSD=1THEN960
890 IFG=3AND(RDORLD)ANDDL=DRTHEN920
900 IF(A=DLANDB=DR)OR(B=DLANDA=DR)THEN920
910 GOTO960
920 PRINTD1$D$"AT WHICH END (L OR R)?"
930 GETA$:IFA$<>"L"ANDA$<>"R"THEN930
940 IFA$="L"THENA=-D*(D=DL)-C*(C=DL):B=-D*(C=DL)-C*(D=DL):GOTO990
950 A=-D*(D=DR)-C*(C=DR):B=-D*(C=DR)-C*(D=DR):GOTO1000
960 IFA=DLTHEN990
970 IFA=DRTHEN1000
980 C=A:A=B:B=C:IFA=DRTHEN1000
990 GOSUB1250:GOTO1010
1000 GOSUB1390
1010 PT=PT-1:FORJ=FTOPT:P%(J,0)=P%(J+1,0):P%(J,1)=P%(J+1,1):NEXTJ
1020 IFSD>0ANDG=3ANDDL=DRTHENPS=PS+2:GOSUB2050:IFLDORRDTHENPS=PS+1
1030 GOSUB1170:GOSUB1200:SD=SD+1:WT=2:RETURN
1040 IFBY=0THENPRINTD1$D$"NO TILES IN YARD.":FORI=1TO3000:NEXT:GOTO680
1050 IFG=3ANDBE=1THENPRINTD1$D$"YOU CAN ONLY DRAW ONCE":FORI=1TO3000:NEXT:GOTO68
0
1060 IFG=1THENPRINTD1$D$"NO DRAW IN THIS GAME.":FORI=1TO2000:NEXT:GOTO680
1070 IFG=2ANDBY=2THENPRINTD1$D$"THE YARD IS FROZEN.":FORI=1TO3000:NEXT:GOTO680
1080 BE=1:PT=PT+1:P%(PT,0)=A%(BY,0):P%(PT,1)=A%(BY,1):BY=BY-1
1090 K1=DL:K2=DR
1100 GOSUB1170:GOSUB1200:GOTO680
1110 IF(G=2ANDBY>2)OR(G=3ANDBY>0ANDBE=0)THEN1130
1120 GOTO1140
1130 PRINTD1$D$"YOU MUST DRAW!":FORI=1TO3000:NEXT:GOTO680
1140 IFG=3ANDBY>0THEN1160
1150 PA=PA+1:IFPA=2THEN2080
1160 K1=DL:K2=DR:WT=2:GOTO670
1170 PRINT"■■■"CL$:PRINT"■■■■"PS
1180 PRINT"■■■"SPC(4)CS:PRINT"■■■"SPC(10)PT:PRINT"■■■"SPC(14)CT:PRINT"■■■"SPC(18
)BY
1190 RETURN
1199 REM **DISPLAY PLAYER'S TILES**
1200 PRINT"■■■■"C1$"■■■■■YOUR ":PRINT"■■■■■TILES":IFPT=0THENRETURN
1210 FORI=0TOPT-1
1220 J=-22*(I>7ANDI<15)-44*(I>18):POKETP+I*2+J,P%(I+1,0)+176:POKETP+I*2+J+CO,0
1230 POKETP+I*2+J+22,P%(I+1,1)+176:POKETP+I*2+J+22+CO,0:NEXTI
1240 RETURN
1249 REM **PUT TILE ON LEFT OF CHAIN**
1250 PA=0:LD=0:IFA=BTHENLD=1
1260 IFLLTHEN1350
1270 IFPEEK(PL)=36THENLL=1:GOTO1340
1280 POKEPL,A+176:POKEPL+CO,CL:IFA=BTHENPOKEPL-22,B+176:POKEPL-22+CO,CL:GOTO1310
1290 IFPEEK(PL+IL)=36THENPOKEPL+22,B+176:POKEPL+22+CO,CL:PL=PL+44:LL=2:GOTO1320
1300 PL=PL+IL:POKEPL,B+176:POKEPL+CO,CL
1310 PL=PL+IL
1320 CL=-6*(CL=0)
1330 DL=B:RETURN
1340 PL=PL+22-IL
1350 IFLL=3THEN1370
1360 POKEPL,A+176:POKEPL+CO,CL:POKEPL+22,B+176:POKEPL+22+CO,CL:PL=PL+44:LL=LL+1:
GOTO1320
1370 IL=-IL:PL=PL+IL-22:POKEPL,A+176:POKEPL+CO,CL:PL=PL+IL:POKEPL,B+176:POKEPL+C
O,CL
1380 LL=0:GOTO1310
1389 REM **PUT TILE ON RIGHT OF CHAIN**
1390 PA=0:RD=0:IFA=BTHENRD=1
1400 IFRLTHEN1490
1410 IFPEEK(PR)=36THENRL=1:GOTO1480
1420 POKEPR,A+176:POKEPR+CO,CR:IFA=BTHENPOKEPR-22,B+176:POKEPR-22+CO,CR:GOTO1450
1430 IFPEEK(PR+IR)=36THENPOKEPR+22,B+176:POKEPR+22+CO,CR:PR=PR+44:RL=2:GOTO1460
1440 PR=PR+IR:POKEPR,B+176:POKEPR+CO,CR
1450 PR=PR+IR
1460 CR=-6*(CR=0)
1470 DR=B:RETURN
1480 PR=PR+22-IR
1490 IFRL=3THEN1510
1500 POKEPR,A+176:POKEPR+CO,CR:POKEPR+22,B+176:POKEPR+22+CO,CR:PR=PR+44:RL=RL+1:
GOTO1460
1510 IR=-IR:PR=PR+IR-22:POKEPR,A+176:POKEPR+CO,CR:PR=PR+IR:POKEPR,B+176:POKEPR+C
O,CR
1520 RL=0:GOTO1450
1529 REM **COMPUTER'S TURN**
1530 PRINT"■":IFSDTHEN1570
1540 J=0:FORF=1TOCT:A=C%(F,0):B=C%(F,1)
1550 IFA+B>JTHENJ=A+B:I=F
1560 NEXT:A=C%(I,0):B=C%(I,1):F=I:DL=A:GOSUB2040:GOSUB1390:GOTO2000
1570 FORI=0TO6:CP%(I)=0:NEXT:FORJ=1TOCT:FORI=0TO6:CP%(I)=CP%(I)-(C%(J,0)=I)-(C%(
J,1)=I)
1580 NEXT:NEXT
1590 IFG<3ORSD<3THEN1680
1600 FORF=1TOCT:A=C%(F,0):B=C%(F,1)
1610 IF(A<>DLORB<>DR)AND(A<>DRORB<>DL)THEN1660
1620 J=(A=DLANDRD)+2*(A=DRANDLD)+3*(B=DLANDRD)+4*(B=DRANDLD)
1630 IFJTHENONJGOTO1870,1880,1890,1900
1640 IFA=DLANDB=DRTHEN1870
1650 IFA=DRANDB=DLTHEN1880
1660 NEXT
1670 IFBY>0ANDCT<=PTTHEN1920
1680 FORF=1TOCT:A=C%(F,0):B=C%(F,1)
1690 IFG=3ANDA=BTHEN1740
1700 IFA=DRAND(B=K1ORB=K2)THEN1880
1710 IFA=DLAND(B=K1ORB=K2)THEN1870
1720 IFB=DLAND(A=K1ORA=K2)THEN1890
1730 IFB=DRAND(A=K1ORA=K2)THEN1900
1740 NEXT
1750 FORI=4TO1STEP-1:FORF=1TOCT:A=C%(F,0):B=C%(F,1)
1760 IFG=3ANDA=BTHEN1790
1770 IF(A=DLORA=DR)ANDCP%(B)>ITHEN1870
1780 IF(B=DLORB=DR)ANDCP%(A)>ITHEN1890
1790 NEXT:NEXT
1800 J=0:FORF=1TOCT:A=C%(F,0):B=C%(F,1)
1810 IFG=3ANDA=BTHEN1840
1820 IF(A=DLANDB=DR)OR(A=DRANDB=DL)THEN1870
1830 IFA+B>JAND(A=DLORA=DRORB=DLORB=DR)THENJ=A+B:I=F
1840 NEXT:IFJTHENA=C%(I,0):B=C%(I,1):F=I:GOTO1870
1850 FORF=1TOCT:A=C%(F,0):B=C%(F,1)
1860 IFG=3ANDA=BANDCT<PT+3ANDBY>0THEN1910
1870 IFA=DLTHENGOSUB2040:GOSUB1250:GOTO2000
1880 IFA=DRTHENGOSUB2040:GOSUB1390:GOTO2000
1890 IFB=DLTHENGOSUB2040:I=A:A=B:B=I:GOSUB1250:GOTO2000
1900 IFB=DRTHENGOSUB2040:I=A:A=B:B=I:GOSUB1390:GOTO2000
1910 NEXTF
1920 IF(G=3ANDBE=1)ORG=1OR(G=2ANDBY=2)ORBY=0THEN1960
1930 PRINTD1$D$"■■I'LL HAVE TO DRAW.":FORI=1TO2000:NEXT
1940 BE=1:CT=CT+1:C%(CT,0)=A%(BY,0):C%(CT,1)=A%(BY,1):BY=BY-1
1950 GOSUB1170:GOTO1570
1960 PRINTD1$D$"■■I'LL HAVE TO KNOCK.":FORI=1TO3000:NEXT
1970 IFG=3ANDBY>0THEN1950
```

(continued on next page)

(continued from previous page)

```
1980 PA=PA+1 IFPA=2THEN2000
1990 WT=1 GOTO670
2000 CT=CT-1 FORJ=FTOCT CX(J,0)=CX(J+1,0) CX(J,1)=CX(J+1,1) NEXTJ
2010 IFSD>0ANDG=3ANDDL=DRTHENCS=CS+2 GOSUB2050 IFLDORPDTHENCS=CS+1
2020 GOSUB1170 SD=SD+1 WT=1 IFCT=0THEN2080
2030 GOTO670
2040 PRINTD1$D$"I'LL PLAY THE"A";"B FORI=1TO3000 NEXT RETURN
2050 PRINTD1$D$. IFLDORPDTHENPRINT"TRIPLE HEADER." GOTO2070
2060 PRINT"DOUBLE HEADER."
2070 FORI=1TO2000 NEXT RETURN
2079 REM **END OF HAND**
2080 FORI=1TO1000 NEXT PRINT"J"
2090 GOSUB620 GOSUB1200 PRINT"■"
2100 IFG=3THEN2170
2110 GOSUB2370 PRINTD$"YOU HAVE"A"SPOTS" PRINT"I HAVE"B"SPOTS■"
2120 IFA<BTHENPRINT"YOU WIN THE HAND" DG=1 GOTO2150
2130 IFA>BTHENPRINT"I WIN THE HAND" DG=2 GOTO2160
2140 PRINT"A DRAWN HAND." DG=0 GOTO2200
2150 PS=PS+B-A GOTO2200
2160 CS=CS+A-B GOTO2200
2170 PRINTD$. IFPT=0THENPRINT"YOU GET ONE POINT FOR GOING OUT" PS=PS+1 DG=1 GOTO
2200
2180 IFCT=0THENPRINT"I GET ONE POINT FOR   GOING OUT" DG=2 CS=CS+1 GOTO2200
2190 PRINT"END OF HAND." DG=0
2200 GOSUB1170 IFPS>=CSORCS<OTTHEN2240
2210 IFDG=1THEN2290
2220 IFDG=0THENA$="I" GOTO2320
2230 GOTO2310
2240 IFPS<OTTHEN2280
2250 IFDG=2THEN2300
2260 IFDG=0THENA$="YOU" GOTO2320
2270 GOTO2310
2280 FORI=1TO6000 NEXT GOTO40
2290 A$="BUT I" GOTO2320
2300 A$="BUT YOU" GOTO2320
2310 A$="AND"
2320 IFPS=CSTHENPRINTD$"■■■■■■■ DRAWN GAME." GOTO2340
2330 PRINTD$"■■■■■■■"A$" WIN THE GAME."
2340 PRINT PRINT"■PRESS RETURN."
2350 GETA$ IFA$<>CHR$(13)THEN2350
2360 RUN
2365 REM **CALCULATE NO. OF SPOTS IN EACH PLAYER'S HAND**
2370 A=0 B=0 IFPT=0THEN2390
2380 FORI=1TOPT A=A+PX(I,0)+PX(I,1) NEXTI
2390 IFCT=0THENRETURN
2400 FORI=1TOCT B=B+CX(I,0)+CX(I,1) NEXTI RETURN
2410 PRINT"■ THE GAME OF DOMINOES IS PLAYED WITH A DECK OF 28 DOUBLE-ENDED"
2420 PRINT"TILES WITH PIPS OR    SPOTS AT EACH END FROM0 TO 6. PLAYERS ARE"
2430 PRINT"DEALT 6 OR 7 TILES    EACH, DEPENDING ON    WHICH GAME IS BEING"
2440 PRINT"PLAYED. THE REMAINDER GOING INTO A POOL     CALLED THE YARD."
2450 PRINT" TILES ARE PLAYED TO  EITHER END OF A CHAIN UNTIL ONE PLAYER HAS"
2460 PRINT"USED ALL HIS TILES OR NEITHER PLAYER CAN GO."
2470 GOSUB2710
2480 ONGGOTO2490,2530,2600
2490 PRINT" IN BLOCK GAME PLAYERSARE DEALT 7 TILES EACHAND THE GAME IS PLAYED";
2500 PRINT"TO 50 POINTS." PRINT" THE PLAYER WITH THE  HIGHEST DOUBLE STARTS"
2510 PRINT"AND PLAYS THAT TILE.  THERE IS NO DRAW FROM THE YARD."
2520 GOTO2670
2530 PRINT" IN DRAW GAME PLAYERS ARE DEALT 7 TILES EACHAND THE GAME IS PLAYED";
2540 PRINT"TO 100 POINTS." PRINT" PLAYERS DRAW TILES   FROM THE DECK TO"
2550 PRINT"DECIDE WHO STARTS.    THE PLAYER WITH THE   HIGHEST NUMBER OF"
2560 PRINT"SPOTS STARTING AND    PLAYING ANY TILE."
2570 PRINT" IF UNABLE TO PLAY,THEPLAYER MUST DRAW FROM THE YARD UNTIL ABLE."
2580 PRINT"THE LAST 2 TILES IN   THE YARD CAN'T BE     DRAWN."
2590 GOTO2670
2600 PRINT" IN BERGEN PLAYERS AREDEALT 6 TILES EACH.   AND THE GAME IS PLAYED";
2610 PRINT"TO 15 POINTS." PRINT" THE PLAYER WITH THE  LOWEST DOUBLE STARTS"
2620 PRINT"AND PLAYS THAT TILE.  IF UNABLE TO PLAY THE PLAYER MUST DRAW FROM"
2630 PRINT"THE YARD. IF STILL    UNABLE TO PLAY THEN   PLAY PASSES TO HIS    OPP
ONENT."
2640 PRINT" POINTS ARE SCORED BY MATCHING ENDS OF THE  CHAIN. AN EXTRA POINT"
2650 PRINT"BEING SCORED IF ONE   END IS A DOUBLE."
2660 GOSUB2710 GOTO130
2670 GOSUB2710 PRINT" POINTS ARE SCORED AT END OF HAND BY THE    PLAYER WITH THE
FEWEST";
2680 PRINT"TOTAL SPOTS ON HIS    REMAINING TILES.      SUBTRACTING HIS SPOTS"
2690 PRINT"FROM HIS OPPONENTS.   THE REMAINDER BEING"
2700 PRINT"THE SCORE FOR THAT    HAND." GOSUB2710 GOTO130
2710 PRINT"■ANY KEY TO CONTINUE"
2720 GETA$ IFA$=""THEN2720
2730 PRINT"■". RETURN

READY.
```

Sound experimenter

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Atari

THIS PROGRAM is for an Atari with at least 32K of memory. It aims to help in understanding sound on the Atari and experiment with the sound.

Type in the program and run it. You should see something like figure 1.

To use sound register 0 type 0, hit Return, type REG, and hit Return. The rest is basically the same. Type in the number, hit Return, command, Return. This is used for the REG, FRE, DIS, VOL commands. Next is the FRC command. It does not have to be preceded by a number. Its function is to produce a click from the TV. A value of one in this place means on and a zero signal that it is off. The first eight lines, B7 to B0, are the bits in the AUDCTL register. To change bit seven to one, type B7, Return. To return it back to zero again, type B7, Return. These changes are technical and give no indication on what the sound will be like. It is best to experiment. Enough to say that using B0 through B4 turns on both sound channels associated with B7.

To hear the sound type in the register number, press Return, type in CH and hit Return again. It is possible is listen to all four channels at once. To turn off the sound type in Off and hit Return. The sound must be off to change one of the parameters. When you want to look at the sound statements to write them down for future reference, type in SDIS and hit Return. This will show the numbers for all four channels. When you use this sound in one of your own programs just type in the same numbers.

If any of the eight bits have a one beside them then in order to view the sound you must type in PDIS. This prints out the Poke statements for that sound. The SDIS command will not give you the full information. Again, when you went to use this sound, just copy the Poke statement into your program.

Figure 1.

```
AUDCTL (REG)ISTER 4
                    9 BIT POLY:(B7):0
      clock Ch.0 w/l.79 MHz:(B6):0
      clock Ch.2 w/l.79 MHz:(B5):0
           clock Ch.1 w/Ch.0:(B4):0
           clock Ch.3 w/Ch.2:(B3):0
       clock Ch.0 w/Ch.2HiP:(B2):0
       clock Ch.1 w/Ch.3HiP:(B1):0
                     15 kHz:(B0):0
     SOUND (REG)ISTER:
         (DIS)TORTION:
         (FRE)QUENCY:
             (VOL)UME:
X:
D: ?
USABLE COMMANDS:
REG DIS FRE FRC VOL OFF CH SDIS
PDIS
```

```
10 REM ************************
20 REM *SOUND EXPERIMENTER*
25 REM *          BY          *
30 REM *   EDWARD UPSDELL     *
40 REM *                      *
50 REM * COPYRIGHT(C)1984 *
60 REM ************************
80 DIM S(5,8),IN$(50),SP$(35)
85 SP$="
":REM 35 SPACES
90 FOR I=0 TO 8:FOR J=0 TO 5:S(J,I)=0:NEXT J
:NEXT I
100 REG=5000:DIS=5100:FRE=5200:FRC=5300:OFF=
5400
102 CLD=5900:CLX=6000:VOL=6100:POKAUD=6200:C
H=6300:START=6400:REGDIS=6500:BUZZ=6600
104 PDIS=6700:SDIS=6800:EDIS=6900
1002 GRAPHICS 0:POKE 752,1
1008 POSITION 2,0:? "AUDCTL (REG)ISTER 4"
1010 POSITION 2,1:? "             9 BIT POLY:(
B7):"
1020 POSITION 2,2:? "clock Ch.0 w/1.79 MHz:(
B6):"
1030 POSITION 2,3:? "clock Ch.2 w/1.79 MHz:(
B5):"
1040 POSITION 2,4:? "    clock Ch.1 w/Ch.0:(
B4):"
1050 POSITION 2,5:? "    clock Ch.3 w/Ch.2:(
B3):"
1060 POSITION 2,6:? "clock Ch.0 w/Ch.2 HiP:(
B2):"
1070 POSITION 2,7:? "clock Ch.1 w/Ch.3 HiP:(
B1):"
1080 POSITION 2,8:? "                15 kHz:(
B0):"
1090 POSITION 2,9:? "  SOUND (REG)ISTER:"
1100 POSITION 2,10:? "       (DIS)TORTION:"
1110 POSITION 2,11:? "        (FRE)QUENCY:"
1120 POSITION 2,12:? "      FORCE OUTPUT:"
1126 POSITION 2,13:? "           (VOL)UME:"
1128 POSITION 2,14:? "X:"
1130 POSITION 2,15:? "D:"
1140 POSITION 2,16:? "USABLE COMMANDS:":POSI
TION 2,17:? "REG DIS FRE FRC VOL OFF CH PDIS
 SDIS"
1500 GOSUB START
2000 REM JUMP TABLE
2008 FOR ZZZ=1 TO 2 STEP 0
2010 POSITION 5,15:POKE 752,0:INPUT IN$:POKE
 752,1
2020 TRAP 2040:A=VAL(IN$):TRAP 40000
2030 POSITION 5,14:? A:GOSUB CLD
2040 IF IN$="REG" THEN GOSUB REG
2042 IF IN$="DIS" THEN GOSUB DIS
2044 IF IN$="FRE" THEN GOSUB FRE
2046 IF IN$="FRC" THEN GOSUB FRC
2048 IF IN$="OFF" THEN GOSUB OFF
2049 IF IN$="CH" THEN GOSUB CH
2058 IF IN$="VOL" THEN GOSUB VOL
2060 IF IN$="B7" THEN S(4,7)= NOT (S(4,7)):P
OSITION 30,1:? S(4,7):GOSUB CLD
2061 IF IN$="B6" THEN S(4,6)= NOT (S(4,6)):P
OSITION 30,2:? S(4,6):GOSUB CLD
2062 IF IN$="B5" THEN S(4,5)= NOT (S(4,5)):P
OSITION 30,3:? S(4,5):GOSUB CLD
2063 IF IN$="B4" THEN S(4,4)= NOT (S(4,4)):P
OSITION 30,4:? S(4,4):GOSUB CLD
2064 IF IN$="B3" THEN S(4,3)= NOT (S(4,3)):P
OSITION 30,5:? S(4,3):GOSUB CLD
2065 IF IN$="B2" THEN S(4,2)= NOT (S(4,2)):P
OSITION 30,6:? S(4,2):GOSUB CLD
2066 IF IN$="B1" THEN S(4,1)= NOT (S(4,1)):P
OSITION 30,7:? S(4,1):GOSUB CLD
2067 IF IN$="B0" THEN S(4,0)= NOT (S(4,0)):P
OSITION 30,8:? S(4,0):GOSUB CLD
2070 IF IN$="PDIS" THEN GOSUB PDIS
2072 IF IN$="SDIS" THEN GOSUB SDIS
2980 IF FAIL=1 THEN GOSUB BUZZ
2989 FAIL=0
2990 NEXT ZZZ
5000 REM REG
5010 IF A<0 OR A>3 THEN FAIL=1:GOTO 5088
5020 IF A>0 OR A<4 THEN POSITION 21,9:? A
5030 C=A
5040 GOSUB REGDIS
5088 GOSUB CLD:GOSUB CLX
5090 RETURN
5100 REM
5110 IF A<0 OR A>14 THEN FAIL=1:GOTO 5180
5112 IF INT(A/2)-A/2<>0 THEN FAIL=1:GOTO 518
0
5120 IF A=0 THEN D1=0
5121 IF A=2 THEN D1=32
5122 IF A=4 THEN D1=64
5123 IF A=6 THEN D1=96
5124 IF A=8 THEN D1=128
5125 IF A=10 THEN D1=160
5126 IF A=12 THEN D1=192
5127 IF A=14 THEN D1=224
5130 POSITION 21,10:? A
5140 S(C,1)=D1:S(C,5)=A
5170 S(C,8)=A
5180 GOSUB CLD:GOSUB CLX
5190 RETURN
5200 REM
5210 IF A<0 OR A>255 THEN FAIL=1
5218 POSITION 21,11:? "   "
5220 POSITION 21,11:? A
```

SOFTWARE File

```
5230 S(C,2)=A
5280 GOSUB CLD:GOSUB CLX
5290 RETURN
5300 REM
5310 IF A=0 THEN S(0,3)= NOT S(0,3)
5320 IF A=1 THEN S(1,3)= NOT S(1,3)
5330 IF A=2 THEN S(2,3)= NOT S(2,3)
5340 IF A=3 THEN S(3,3)= NOT S(3,3)
5350 POSITION 21,12:? S(C,3)
5380 GOSUB CLD
5390 RETURN
5400 POKE 53761,0:POKE 53763,0:POKE 53765,0:
POKE 53767,0
5480 GOSUB CLD
5900 REM
5910 POSITION 5,15:? SP$(1,20)
5990 RETURN
6000 REM
6010 POSITION 5,14:? SP$(1,21):A=0
6090 RETURN
6100 REM
6110 IF A<0 OR A>15 THEN FAIL=1:GOTO 6180
6120 POSITION 21,13:? "            "
6122 POSITION 21,13:? A
6130 S(C,4)=A
6180 GOSUB CLD:GOSUB CLX
6190 RETURN
6200 REM
6208 SUM=0
6210 IF S(4,0)=1 THEN SUM=SUM+1
6211 IF S(4,1)=1 THEN SUM=SUM+2
6212 IF S(4,2)=1 THEN SUM=SUM+4
6213 IF S(4,3)=1 THEN SUM=SUM+8
6214 IF S(4,4)=1 THEN SUM=SUM+16
6215 IF S(4,5)=1 THEN SUM=SUM+32
6216 IF S(4,6)=1 THEN SUM=SUM+64
6217 IF S(4,7)=1 THEN SUM=SUM+128
6220 POKE 53768,SUM
6290 RETURN
6300 REM CH
6310 GOSUB POKAUD
6320 IF A=0 THEN POKE 53761,S(0,1)+S(0,4):PO
KE 53760,S(0,2)
6322 IF A=1 THEN POKE 53763,S(1,1)+S(1,4):PO
KE 53762,S(1,2)
6324 IF A=2 THEN POKE 53765,S(2,1)+S(2,4):PO
KE 53764,S(2,2)
6326 IF A=3 THEN POKE 53767,S(3,1)+S(3,4):PO
KE 53766,S(3,2)
6380 GOSUB CLX:GOSUB CLD:GOSUB REGDIS
6390 RETURN
6400 REM START
6410 FOR I=1 TO 8:POSITION 30,I:? "0":NEXT I
6490 RETURN
6500 REM REGDIS
6505 POSITION 21,12:? "   "
6506 POSITION 21,12:? S(C,3)
6507 POSITION 21,11:? "         "
6508 POSITION 21,11:? S(C,2)
6520 POSITION 21,10:? "         "
6521 POSITION 21,10
6522 IF S(C,1)=224 THEN ? "14"
6523 IF S(C,1)=192 THEN ? "12"
6524 IF S(C,1)=160 THEN ? "10"
6525 IF S(C,1)=128 THEN ? "8"
6526 IF S(C,1)=96 THEN ? "6"
6527 IF S(C,1)=64 THEN ? "4"
6528 IF S(C,1)=32 THEN ? "2"
6529 IF S(C,1)=0 THEN ? "0"
6530 POSITION 21,13:? "         "
6531 POSITION 21,13:? S(C,4)
6590 RETURN
6600 REM BUZZ
6610 ? CHR$(125):REM CLEAR SCREEN
6690 RETURN
6700 REM PDIS
6705 GOSUB EDIS
6710 POSITION 2,22:? "POKE 53768, ";SUM
6720 POSITION 20,18:? "POKE 53761, ";S(0,1)+
S(0,4):POSITION 2,18:? "POKE 53760, ";S(0,2)
6730 POSITION 20,19:? "POKE 53763, ";S(1,1)+
S(1,4):POSITION 2,19:? "POKE 53762, ";S(1,2)
6740 POSITION 20,20:? "POKE 53765, ";S(2,1)+
S(2,4):POSITION 2,20:? "POKE 53764, ";S(2,2)
6750 POSITION 20,21:? "POKE 53767, ";S(3,1)+
S(3,4):POSITION 2,21:? "POKE 53766, ";S(3,2)
6780 GOSUB CLD
6790 RETURN
6800 REM SDIS
6805 GOSUB EDIS
6810 POSITION 2,19:? "SOUND 0, ";S(0,2);", "
;S(0,8);", ";S(0,4)
6820 POSITION 2,20:? "SOUND 1, ";S(1,2);", "
;S(1,8);", ";S(1,4)
6830 POSITION 2,21:? "SOUND 2, ";S(2,2);", "
;S(2,8);", ";S(2,4)
6840 POSITION 2,22:? "SOUND 3, ";S(3,2);", "
;S(3,8);", ";S(3,4)
6880 GOSUB CLD
6890 RETURN
6900 POSITION 2,18:? SP$
6910 POSITION 2,19:? SP$
6920 POSITION 2,20:? SP$
6930 POSITION 2,21:? SP$
6940 POSITION 2,22:? SP$
6950 RETURN
9000 POSITION 2,18:? SP$
9010 POSITION 2,19:? SP$
9020 POSITION 2,20:? SP$
9030 POSITION 2,21:? SP$
9040 POSITION 2,22:? SP$
9050 RETURN
10000 END
```

Speedy commands

Brian Allan,
Scuntfield,
County Down.

Dragon

HERE ARE two routines for the Dragon. One of them lets you enter 52 commands by pressing two keys. The second one lets you change the speed of printing. First, I will show you how to use the single-key entry routine. Enter the listing. Save this then run it.

The routines are now activated. To use the single key entry option press the down arrow. The black cursor will change to a graphic character. To get a command press any letter — experiment for yourselves. 52 commands are available by using Shift. To enter the command

EDIT

press E. Edit should appear on the screen. You can put a line number after it. To enter a command like Point press P then the down arrow then J—Point will appear on the screen.

The print speed is held in locations 1022 and 1023. After the hex loader has finished enter

POKE 1022,20: LIST

You will see the program list slowly. The higher the value in 1022 and 1023 the slower the print speed. To switch off both routines enter

EXEC 32252

```
10 REM ******************
20 REM ** ONE KEY ENTRY **
30 REM ** & PRINT SPEED **
40 REM ** M/C. ROUTINE. **
50 REM ******************
60 REM **BY BRIAN ALLAN.**
70 REM ******************
80 CLEAR 200,32224
90 CLS
100 PRINTTAB(9);"KEYWORD & PRINT"
110 PRINTTAB(9);"***************"
120 PRINT"please wait...LOADING THE HEX."
130 PRINT:PRINT"LOCATIONS."
140 PRINT:PRINT"'EXEC 32225' - ROUTINES ON.":PRINT "'E
XEC 32252' - ROUTINES OFF."
150 PRINT:PRINT "PEEK(1022)*256+PEEK(1023) IS THEPRINT
 DELAY."
160 PRINT:PRINT "FOR KEYWORD - PRESS THE DOWN    ARROW
 THEN A (SHIFT-LETTER) OR  (LETTER).52 COMMANDS AVAILA
BLE."
170 FOR AD=32225 TO 32767 STEP 10
180 CS=0
190 FOR Z=AD TO AD+9
200 READ H$:H=VAL("&H"+H$)
210 CS=CS+H
220 POKE Z,H
230 IF Z=32767 THEN 270
240 NEXT Z
250 READ CS$:SS=VAL("&H"+CS$)
260 IF SS<>CS THEN PRINT:PRINT "THERE IS AN ERROR IN L
INE";PEEK(49)*256+PEEK(50):END
270 NEXT AD
280 PRINT:PRINT:PRINT"ALL LOADED AND BOTH ROUTINES
ACTIVATED."
290 PRINT:PRINT
300 EXEC 32225
310 END
320 REM DATA FOR ROUTINES.
330 DATA 86,7E,B7,1,6A,B7,1,67,8E,7E,451
340 DATA 15,BF,1,6B,8E,7E,5,BF,1,68,379
350 DATA 8E,0,0,BF,3,FE,39,86,39,B7,3FD
360 DATA 1,67,B7,1,6A,39,BF,3,FC,BE,43F
370 DATA 3,FE,30,1,30,1F,26,FC,BE,3,364
380 DATA FC,39,81,A,26,E2,C1,E6,22,DE,56F
390 DATA BF,3,F2,10,BF,3,F4,FD,3,F6,570
400 DATA 86,C9,10,9E,88,A7,A4,7F,1,19,499
410 DATA BD,B5,D,73,1,49,81,41,10,25,333
420 DATA 0,8A,81,7A,10,22,0,84,81,5B,317
430 DATA 25,6,81,60,22,2,20,7A,81,5B,2A6
440 DATA 25,2,80,6,80,40,8E,7E,D2,5F,3AA
450 DATA B7,3,F8,5C,F1,3,F8,27,8,A6,4CF
460 DATA 60,81,0,26,FA,20,F2,BF,3,F9,4EE
470 DATA 10,BE,3,F2,A6,80,81,0,27,7,398
480 DATA A7,A0,7C,3,F7,20,F3,10,BF,3,4A2
490 DATA F2,BE,3,F9,10,9E,88,A6,80,81,589
500 DATA 0,27,36,81,40,22,2,88,40,A7,2B4
510 DATA A0,10,8C,5,FF,22,2,20,EA,10,37E
520 DATA BF,3,FB,10,8E,4,0,E6,A8,20,40D
530 DATA E7,A0,10,8C,5,E0,25,F5,C6,60,548
540 DATA E7,A0,10,8C,6,0,25,F8,10,BE,414
550 DATA 3,FB,31,A8,E0,20,C4,10,9F,88,4D2
560 DATA BE,3,F2,10,BE,3,F4,FC,3,F6,56D
570 DATA 39,41,55,44,49,4F,0,44,49,4D,285
580 DATA 0,43,4C,45,41,52,0,52,45,41,23F
590 DATA 44,0,45,58,45,43,0,46,4F,52,250
600 DATA 0,47,4F,54,4F,0,50,52,49,4E,272
610 DATA 54,0,49,4E,50,55,54,0,4A,4F,27D
620 DATA 59,53,54,48,28,0,43,49,52,43,294
630 DATA 4C,45,28,0,4C,49,53,54,0,53,248
640 DATA 4F,55,4E,44,0,54,48,45,4E,0,265
```

(continued on next page)

(continued from previous page)

```
650 DATA 4F,50,45,4E,0,50,4D,4F,44,45,2A7
660 DATA 0,44,52,41,57,0,52,45,54,55,26E
670 DATA 52,4E,0,53,43,52,45,45,4E,0,260
680 DATA 43,4C,4F,41,44,0,43,4C,53,0,245
690 DATA 53,45,54,28,0,53,54,45,50,0,250
700 DATA 4C,45,46,54,24,28,0,52,55,4E,26C
710 DATA 0,50,4F,4B,45,0,4D,4F,54,4F,26E
720 DATA 52,0,52,45,4D,0,43,4F,4C,4F,263
730 DATA 52,0,44,41,54,41,0,45,44,49,23E
740 DATA 54,0,4E,45,58,54,0,47,4F,53,27C
750 DATA 55,42,0,45,4C,53,45,0,49,4E,257
760 DATA 4B,45,59,24,0,50,4F,49,4E,54,297
770 DATA 28,0,50,41,49,4E,54,28,0,4C,218
780 DATA 49,4E,45,0,41,4E,44,0,54,41,244
790 DATA 42,28,0,43,4C,4F,53,45,0,50,230
800 DATA 43,4F,50,59,0,43,48,52,24,28,264
810 DATA 0,52,45,53,54,4F,52,45,0,53,277
820 DATA 54,52,49,4E,47,24,28,0,43,53,266
830 DATA 41,56,45,0,53,4B,49,50,46,0,259
840 DATA 52,45,53,45,54,28,0,52,49,47,28D
850 DATA 48,54,24,28,0,4D,49,44,24,28,20E
860 DATA 0,52,45,4E,55,4D,0,50,45,45,261
870 DATA 4B,28,0,73
880 END
```

Sideways dump

*M K Mostowyj,
Bretton Estate,
Peterborough.*

Amstrad

THIS PROGRAM will produce a hard copy of any screen in any mode as long as the graphics origin is set to its default (0,0). The final printout is two tone only and assumes that the background colour is Paper 0.

The program is written in machine code. It is 202 bytes long and is located at &AAB3. Rather than having to use the Call statement to run the program, a new command is implemented via the resident system extention capability of the Amstrad.

To enter the program type in the basic listing and run it. If all is well you will be given the chance to save the code to tape.

To reload the code type:

MEMORY &AAB2:LOAD"",&AAB3

and press Return. Once loaded

CALL &AAB3

to log on the new command. If you are using a Paper other than 0 you may inform the routine with

POKE &AAF8,n

where n= the Paper being used. Please take note that it is Paper and not Ink.

Listing 1.

```
10 MODE 1
20 MEMORY &AAB2
30 SUM=0:RESTORE 170
40 FOR N=&AAB3 TO &AB7C
50 READ X$
60 POKE N,VAL("&"+X$)
70 SUM=SUM+VAL("&"+X$)
80 NEXT
90 IF SUM<>&5FA8 THEN SOUND 1,254,10:PRINT CLS:PRINT"
DATA WRONG PLEASE CHECK":END
100 CLS:PRINT"DATA LOADED CORRECTLY"
110 PRINT:PRINT"PLEASE INSERT TAPE FOR BYTES"
120 PRINT:PRINT"THEN PRESS ANY KEY"
130 IF INKEY$="" THEN 130
140 CLS:PRINT"SAVING DUMP,B,&AAB3,&CA"
150 SAVE "DUMP",B,&AAB3,&CA
160 END
170 DATA 01,c1,aa,21,bd,aa,cd,d1,bc,c9,00,00,00,00,c6,aa
180 DATA c3,d1,aa,44,55,4d,d0,00,00,00,00,00,00,00,cd,06
190 DATA b9,21,00,00,22,cb,aa,22,cd,aa,01,00,00,c5,3e,00
200 DATA 32,d0,aa,3c,32,cf,aa,06,07,c5,ed,5b,cb,aa,2a,cd
210 DATA aa,cd,df,bd,fe,00,28,0b,3a,cf,aa,47,3a,d0,aa,80
220 DATA 32,d0,aa,3a,cf,aa,a7,cb,17,32,cf,aa,2a,cb,aa,23
230 DATA 22,cb,aa,c1,10,d3,3e,1b,cd,73,ab,3e,4b,cd,73,ab
240 DATA 3e,00,cd,73,ab,3e,01,cd,73,ab,3a,d0,aa,cd,73,ab
250 DATA 2a,cb,aa,11,07,00,a7,ed,52,22,cb,aa,c1,03,78,fe
260 DATA 01,20,26,79,fe,91,20,21,3e,0a,cd,73,ab,2a,cb,aa
270 DATA 11,07,00,19,22,cb,aa,7c,fe,02,c2,dd,aa,7d,fe,84
280 DATA c2,dd,aa,3e,0f,cd,73,ab,c9,ed,43,cd,aa,c3,e0,aa
290 DATA c5,47,cd,2b,bd,78,30,fa,c1,c9
```

Listing 2.

```
AAB3  01 C1 AA 21 BD AA CD D1
AABB  BC C9 00 00 00 00 C6 AA
AAC3  C3 D1 AA 44 55 4D D0 00
AACB  00 00 00 00 00 00 CD 06
AAD3  B9 21 00 00 22 CB AA 22
AADB  CD AA 01 00 00 C5 3E 00
AAE3  32 D0 AA 3C 32 CF AA 06
AAEB  07 C5 ED 5B CB AA 2A CD
AAF3  AA CD DF BD FE 00 28 0B
AAFB  3A CF AA 47 3A D0 AA 80
AB03  32 D0 AA 3A CF AA A7 CB
AB0B  17 32 CF AA 2A CB AA 23
AB13  22 CB AA C1 10 D3 3E 1B
AB1B  CD 73 AB 3E 4B CD 73 AB
AB23  3E 00 CD 73 AB 3E 01 CD
AB2B  73 AB 3A D0 AA CD 73 AB
AB33  2A CB AA 11 07 00 A7 ED
AB3B  52 22 CB AA C1 03 78 FE
AB43  01 20 26 79 FE 91 20 21
AB4B  3E 0A CD 73 AB 2A CB AA
AB53  11 07 00 19 22 CB AA 7C
AB5B  FE 02 C2 DD AA 7D FE 84
AB63  C2 DD AA 3E 0F CD 73 AB
AB6B  C9 ED 43 CD AA C3 E0 AA
AB73  C5 47 CD 2B BD 78 30 FA
AB7B  C1 C9
```

Wild West

*Anszar Zerfass,
Lehrberg,
West Germany.*

Spectrum

THIS GAME uses the excellent Sprite routine by Robert Newman — *Your Computer* January, 1984, page 106 — to create smooth animated graphics in different colours. The programs will work on the 48K machine only. However, it may be changed for a 16K Spectrum by changing the Clear statement in line 10 to

CLEAR 31199

and by changing all Peek and Poke addresses except line 10. The new values for Peek, Poke and Rand USR statements can be calculated from the information in Newman's article.

The main program.

```
   3 REM LINE 20 LOADS MACHINE
        CODE SPRITE ROUTINE BY
        R.NEWMAN - YOUR COMPU-
        TER 1/84.PAGE 106

  10 POKE 23658,0: BORDER 0: PAP
ER 0: INK 0: INVERSE 0: OVER 0
BRIGHT 0: FLASH 0: CLEAR 63999
  15 PRINT AT 5,7; PAPER 6; INK
0;" -- WILD WEST -- ";#0;"  DO
N'T STOP THE TAPE YET!    ";AT 1
4,0;
  20 FOR F=1 TO 25: BEEP .005,F
 NEXT F: LOAD ""CODE
  25 LET CU=0: LET PU=CU: GO TO
800
  35 LET HI=0: LET CHI=HI: LET H
I1=HI: LET CHI1=CHI
  40 GO SUB 500
  45 RANDOMIZE USR 65148
  50 LET I$=INKEY$: IF PEEK 6520
7=0 THEN IF I$="P" OR I$="L" THE
N POKE 65203,1-(2 AND I$="L"): P
OKE 65207,5
  51 IF NOT WAG THEN IF RND>.96
THEN LET WAG=1: POKE 65260,120:
POKE 65261,16: POKE 65267,255: P
OKE 65259,0: POKE 65268,1
  52 IF PEEK 65222=0 THEN POKE 6
5218,2-(4 AND RND<.5): POKE 6522
2,5
  54 IF I$="Q" THEN IF NOT SP TH
EN POKE 65230,129: POKE 65231,(P
EEK 65201)-6: POKE 65237,254: PO
KE 65238,1: LET SP=1
  56 IF NOT SC THEN IF RND>.1 TH
EN POKE 65245,82: POKE 65246,(PE
EK 65216)-6: POKE 65252,254: POK
E 65253,1: LET SC=1
  58 IF SP THEN IF PEEK 65230=0
THEN POKE 65238,0: POKE 65239,0
 PRINT AT 21-INT (PEEK 65231/8),
0;" ": LET SP=0
  60 IF SP THEN IF PEEK 65239=12
8 THEN GO SUB 70
  62 IF SC THEN IF PEEK 65245=25
2 THEN POKE 65253,0: POKE 65254,
0: PRINT AT 21-INT (PEEK 65246/8
),31;" ": LET SC=0
  64 IF SC THEN IF PEEK 65254=12
8 THEN GO SUB 75: IF SP THEN IF
PEEK 65239=128 THEN GO SUB 70
  65 IF CHI<>CHI1 OR HI<>HI1 THE
N LET CHI1=CHI: LET HI1=HI: GO T
```

```
  40+(120 AND (CHI=3 OR HI=3))
  65 GO TO 50
  70 LET SP=0: POKE 65238,0: POK
E 65239,0: IF PEEK 65230<62 AND
PEEK 65230>50 THEN GO TO 100
  71 IF PEEK 65230<132 AND PEEK
65230>120 THEN POKE 65268,0: LET
 WAG=0: LET CY=15: LET CX=21-INT
 (PEEK 65261/8): FOR F=5 TO 0 ST
EP -1: PRINT AT CX,CY; INK 2+(F/
2=INT (F/2));"CD";AT CX+1,CY;"EF
": BEEP .005,F: NEXT F: PRINT AT
 CX,CY;"  ";AT CX+1,CY;"  ";AT C
X+2,CY;"  ": RETURN
  72 LET CY=INT (PEEK 65230/8):
LET CX=21-INT (PEEK 65231/8): PR
INT AT CX,CY; INK 2; FLASH 1;"A"
: BEEP .005,0: PRINT AT CX,CY;"
": RETURN
  75 LET SC=0: POKE 65253,0: POK
E 65254,0: IF PEEK 65245>195 AND
 PEEK 65245<212 THEN GO TO 110
  76 IF PEEK 65245<132 AND PEEK
65245>117 THEN POKE 65268,0: LET
 WAG=0: LET CY=15: LET CX=21-INT
 (PEEK 65261/8): FOR F=5 TO 0 ST
EP -1: PRINT AT CX,CY; INK 2+(F/
2=INT (F/2));"CD";AT CX+1,CY;"EF
": BEEP .005,F: NEXT F: PRINT AT
 CX,CY-1;"  ";AT CX+1,CY-1;"
";AT CX+2,CY-1;"  ": RETURN
  77 LET CX=21-INT (PEEK 65246/8
): LET CY=INT (PEEK 65245/8): LE
T CY=CY+(ATTR (CX,CY)<>52): PRIN
T AT CX,CY; INK 3; FLASH 1;"A":
BEEP .005,0: PRINT AT CX,CY-1;"
": RETURN
 100 FOR F=0 TO 255 STEP 5: BEEP
 .01,F/10: OUT 254,F: NEXT F: LE
T CHI=CHI+1: GO SUB 150
 105 RETURN
 110 FOR F=255 TO 0 STEP -5: BEE
P .01,F/10: OUT 254,F: NEXT F: L
ET HI=HI+1: GO SUB 150
 115 RETURN
 150 LET S$="HITS="+STR$ CHI+"
-- WILD WEST -- HITS="+STR$ HI+
"": INPUT "": PRINT #0; PAPER 5
; INK 1;S$: RETURN
 160 IF CHI=3 AND HI=3 THEN LET
S$=" --- BOTH HAVE BEEN KILLED -
-- ": GO TO 200
 170 IF CHI=3 THEN LET PW=PW+1:
LET S$=" --- YOU HAVE SURVIVED
!! ---"
 180 IF HI=3 THEN LET CW=CW+1: L
ET S$=" --- YOU HAVE BEEN KILLE
D ---"
 200 RANDOMIZE USR 65155: PRINT
AT 4,0; BRIGHT 1; PAPER 5; INK 0
;S$
 210 LET S$=" SCORE: SLIM JOEY "
+STR$ CW+" - YOU "+STR$ PW
 220 IF LEN S$<32 THEN LET S$=S$
+" ": GO TO 220
 230 PRINT AT 20,0; PAPER 7; INK
 1;S$
 240 INPUT "": PRINT #0; INK 0;"
 Another game (Press Y or N) ?
": BEEP .5,-12
 250 IF INKEY$="y" THEN CLS : GO
 TO 870
 260 IF INKEY$="n" THEN GO TO 99
99
 270 GO TO 250
 500 RANDOMIZE USR 65155
 505 BORDER 6: PAPER 6: INK 0: C
LS : GO SUB 150
 510 FOR F=65208 TO 65313 STEP 1
5: POKE F,0: NEXT F
 515 RANDOMIZE : RESTORE 520: FO
R F=65200 TO 65274: READ G: POKE
 F,G: NEXT F
 520 DATA 200,INT (RND*140)+25,0
,0,LEV,2,0,0,1,0,0,250,0,11,15
 530 DATA 50,INT (RND*140)+25,0,
0,2,2,0,0,1,0,32,250,0,11,15
 540 DATA 188,0,-3,0,1,0,0,254,0
,0,64,250,0,3,1
 550 DATA 62,0,4,0,1,0,0,254,0,0
,64,250,0,3,1
 560 DATA 0,0,0,1,4,2,0,255,0,0,
96,250,0,12,16
 570 LET SC=0: LET SP=0: LET WAG
=0
 580 RANDOMIZE : FOR F=1 TO 4: F
OR G=1 TO INT (RND*6)+6: PRINT A
T INT (RND*22),INT (RND*4)+(1 AN
D F=1)+(9 AND F=2)+(18 AND F=3)+
(27 AND F=4); INK 4;CHR$ (144+(R
ND>.5)): NEXT G: NEXT F
 590 FOR F=0 TO 21: PRINT AT F,6
; INK 2;" ";AT F,25; INK 1;" "
: NEXT F
 600 RETURN
 800 BORDER 1: PAPER 5: INK 1: B
RIGHT 1: CLS
 810 PRINT AT 1,7; BRIGHT 0; PAP
ER 7;" -- WILD WEST -- "
 820 PRINT AT 3,0;" Here you are
 again - a lone      cowboy facin
g death under the    hot sun burn
ing down on the      wide desert.
"
 830 PRINT '" No one there to he
lp you -      you're on your own
 against         Slim Joey, whose n
ame is           feared throughout
the west."
 835 PRINT '" He moves faster, h
is bullet is  faster - so good l
uck, boy!"
 840 PRINT '" You will only surv
ive 2 hits.    And you cannot mov
e once Joey   has been hit, his
bullet may    hit you in the mea
ntime."
 850 GO SUB 1000: PRINT #0; PAPE
R 6; INK 0;"           PRESS ANY K
EY!         ": BEEP 1,-10: PAUSE
 0: CLS
 860 PRINT '" The cacti and cove
red waggons   will gain you no b
onus points.  It is just him or
you."
 870 PRINT '"" Move by pressing
keys P or L     (up/down) and pul
l the trigger  by pressing key O
."
 880 PRINT AT 19,0;" Press key 1
-6 to select game      level (1-6,
6=hard)   ": BEEP 1,-12
 890 LET I$=INKEY$: IF I$<"1" OR
 I$>"6" THEN GO TO 890
 900 LET LEV=VAL I$: BRIGHT 0: G
O TO 30
1000 RESTORE 1000: FOR F=USR "A"
 TO USR "F"+7: READ G: POKE F,G:
 NEXT F
1010 DATA 16,144,146,146,242,18,
30,16,16,16,18,146,146,158,240,1
6
1020 DATA 2,17,9,5,37,21,108,44,
0,0,4,72,80,36,168,176
1030 DATA 36,21,138,74,38,27,7,7
,178,164,168,176,83,252,128,192
1040 FOR F=64000 TO 64061: READ
G: POKE F,G: NEXT F
1050 DATA 7,0,15,128,5,0,9,0,5,0
,2,0,199,224,63,160,15,160,15,64
,15,128,7,128,5,0,5,0,11,0,0,0,2
8,0,62,0,20,0,18,0,20,0,8,0,252,
96,191,128,190,0,94,0,62,0,60,0,
20,0,20,0,26,0,0,0,224
1060 FOR F=64096 TO 64127: READ
G: POKE F,G: NEXT F: RETURN
1070 DATA 15,0,16,128,96,96,192,
48,192,48,192,48,192,48,192,48,1
92,48,192,48,64,32,63,192,15,0,1
59,144,255,240,128,16
9999 CLS : PRINT AT 10,8;"© A.ZE
RFASS 1984"
```

The game Wild West allows one player to take part in a deadly gunfight. Full instructions are included in the program. It is you against Slim Joey, who is controlled by the computer. Joey will be able to move faster than you — especially on the higher levels — so he's a really tough opponent. Some extra features are cacti spread all over the scenario — a desert — and a covered wagon which will appear at random and will explode if hit by a bullet.

Type in the program carefully and save it on tape with

SAVE "wild west" LINE 1

Load the 48K Sprite routine and save it immediately behind the main program with

SAVE "spmov48k" CODE 64551,611

Verify the recordings and try to run the program. Check all Peek/Poke/Rand USR statements and the sprite data hold in lines 520-560 and 1050-1070 — graphics — if the game does not work properly.

A lot of work may be saved by editing similar lines and changing the small differences — e.g. 70-72 and 75-77.

Program structure.

Lines	Function
1-25	Set-up
50-86	Main loop
70-72	Subroutine: Player's bullet hit
75-77	Subroutine: Joey's bullet hit
100-110	Subroutine: Player/Joey hit
150	Subroutine: Print score table
160-270	End of game
500-600	Subroutine: Set up screen and Poke initial values for sprites
800-900	Instructions and selection of skill level
1000-1070	Subroutines: Set up user-defined graphics (1000-1030) and sprite graphics (1040-1070)

The hex loader.

```
  10 DEF FN h(h$)=16*(CODE h$(1)
-48-(7 AND h$(1)>"9"))+CODE h$(2
)-48-(7 AND h$(2)>"9")
  20 INPUT "Start ";s
  30 INPUT "Finish ";f
  40 FOR n=s TO f STEP 8
  50 LET tot=0: PRINT n;": ";
  60 INPUT h$: PRINT h$;
  70 LET x=0
  80 FOR b=1 TO LEN h$ STEP 2
  90 LET z=FN h(h$): LET tot=tot
+z
 100 POKE n+x,z
 110 LET h$=h$(3 TO ): LET x=x+1
 120 NEXT b
 130 PRINT " = ";: INPUT t: PRIN
T t
 140 IF tot<>t THEN PRINT "input
 error - try again": GO TO 50
 150 NEXT n
 160 REM enter STOP to stop
```

The machine code.

```
64551: 2A94FE22A0FE3A8B = 1089
64559: FE329DFEDD460EC5 = 1217
64567: 3A9DFEFEFF2004DD = 1235
64575: 3613AF3A6AFE329C = 904
64583: FE2AA0FE5623SE23 = 960
64591: 22A0FEED4B9CFECD = 1375
64599: AA223299FE329EFE = 1123
64607: 2FE60730329EFE32 = 853
64615: 9FFEDD8612329CFE = 1246
64623: DD361000CD83FCED = 1167
64631: 4B9CFEAF3299FE32 = 1167
64639: 9AFEDD361108CDAA = 1083
64647: 224ECDCEFC3A9CFE = 1243
64655: C608329CFEED4B9C = 1134
64663: FECDAA223A9EFE32 = 1183
64671: 9BFE3A9FFE329AFE = 1338
64679: DD360F004ECDC3FC = 1020
64687: DD3513C11081C94E = 910
64695: 3A99FEFE002805CB = 967
64703: 013D20FB3A9BFEFE = 1066
64711: 002835FE0820157A = 530
64719: DDCB1846200042FA1 = 762
64727: 1806A1C40DFD7AB1 = 952
64735: 4F5371C9CB23CB12 = 935
64743: 3804CB01180FDDCB = 727
64751: 18462807CB11DC0D = 594
64759: FD1802CB213D20E4 = 836
64767: 3A9AFEFE002805CB = 963
64775: 013D20FB71C9DDCB = 1083
64783: 09FEC9DD360900DD = 969
64791: CB027E28103AA3FE = 862
64799: FE00283FDDBE0028 = 808
64807: 1C303818183A8AFE = 630
64815: DD860D329EFE3AA3 = 1051
64823: FEDD860DFEFF2823 = 1206
64831: DDBE14381EDDCB03 = 944
64839: 7E20083AA4FEFEAF = 1071
64847: 3040C93AA4FEDD96 = 1150
64855: 0E3CFE002834FEB0 = 850
64863: 3030C9DDCB09C6DD = 1149
64871: CB054620D8AFDDCB = 1125
64879: 027E20053EFFDD96 = 853
64887: 0D32A3FEDDCB054E = 987
64895: 2006AF3291FE18BD = 875
64903: 3A8CFEED44328CFE = 1201
64911: 18B3DDCB09C8DDCB = 1258
64919: 054620243EAFDDCB = 804
64927: 037E28053EFFDD86 = 846
64935: 0E32A4FEDDCB054E = 989
64943: 2005AF3291FEC93A = 920
64951: 8DFEED44328DFEC9 = 1346
64959: 3AA4FEFEB0D8C650 = 1400
64967: DDCB037E2802C650 = 889
64975: 32A4FEC921B0FE11 = 1149
64983: 0F000808C5DEE5E5 = 897
64991: DDE1DDCB0846200E = 991
64999: DDCB0CFEE1D1C119 = 1342
65007: 10EAC9DDCB0C7E28 = 1053
65015: 28CD5DFEDD361801 = 895
65023: CD27FCDDCB097E28 = 1095
65031: 0ADDCB0646200400D = 767
65039: 3807003A8EFE3295 = 715
65047: FEDDE5E1D1C1C5D5 = 1741
65055: EDB018C8DD350C20 = 955
65063: C3DD7E07FE0028C9 = 1044
65071: FEFF2803DD3507CD = 1038
65079: 5DFE3A8AFEDD8602 = 1154
65087: 32A3FE3A8BFEDD86 = 1273
65095: 0332A4FEDD361800 = 770
65103: CD27FCCD12FD2AA3 = 1177
65111: FE228AFE189E118A = 1017
65119: FE010F00C5DDE1ED = 1166
65127: B0C9F3F5C5D5E5DD = 1725
65135: E5CD03FDDDE1E1D1 = 1778
65143: C1F1C338003E09ED = 993
65151: 47ED5EC93E3EED56 = 1050
65159: ED47C900 = 509
```

Graphics 7 Paintbox

Christopher Jones, Herne Bay, Kent.

Atari

THIS PROGRAM allows the user to draw a picture on a Graphics screen. These pictures may be stored on cassette for retrieval at a later time, so that finished pictures may be viewed again and again or unfinished pictures completed. A number of paint programs are now on the Atari market, but my program allows the user to sample the possibilities of this type of program without parting with any cash!

One of the main considerations while writing this program was to keep it as user-friendly as possible. There are on-screen prompts at all times, and all options are performed in a similar way. In addition to the joystick only the number keys are used to carry out instructions. Although the Atari computer has a vast range of colours to display, I have deliberately kept the choice down to a simple minimum.

The colours are also named — rather than using a combination of hue and luminance — which means that children of reading age should be able to use the program. If anyone is not satisfied with my choice of colours they are easily changed: lines 3000-5000 contain the relevant routines.

When you have typed in the program save it on a cassette and then run it. The screen will show a menu of options:

SCREEN — First select the screen colour of your choice.

PALETTE — Next select three colours with which you wish to draw your picture.

COLOUR — This command allows you to choose a working colour from your palette. This colour will then be used when you select draw, circle, etc.

DRAW — A cursor will appear in the centre of the screen in the colour you have chosen. Move the cursor by pushing the joystick in the required direction. If you wish to draw then keep the joystick button depressed and move the joystick in the required direction. To plot a point — useful for stars — simply fire the button once and move on.

DRAWTO — A cursor will appear in the centre of the screen. Move the cursor to one end of the line you wish to draw and hit any key. Then move the cursor to the other end and hit any key. A line will be drawn between the two points.

ERASE — When the cursor appears move it to the area you wish to erase. Hold the joystick button down and move over the points and lines you wish to erase.

CIRCLE — Move the cursor to the point where you wish the circle's centre to be and hit any key. Then move the cursor left or right to establish the radius of the circle and hit any key.

FILL — Move the cursor to the area you wish to fill and hit any key. The area must be enclosed and must be filled with the same colour with which it was drawn. Awkward shapes may need more than one fill.

SAVE — Put a blank tape in the casette unit. When you hear two beeps press play and record, then hit return.

LOAD — Put the tape on which you saved the picture in the cassette unit. When you hear a beep press play, then hit return.

Choose your screen colour carefully. It need not be merely a background, but an integral part of the picture e.g. a grey screen colour could be used for the surface of the moon.

If you wish to erase part of a filled in area select a working colour which will show up against that area and then select erase. When the picture is finished try putting a frame around it by using draw or drawto.

Screen colours and palette colours can be changed at any time, often with interesting results. Experimentation is the best approach in this respect, so don't be shy!

If the program should stop for any reason — such as a misuse of Fill — then type Goto 1000 and you will be able to continue work on that picture.

The circle routine in my program is based on the one in Ian Sinclair's *Boots Guide to the Atari 600XL*. I have adapted it to plot a continuous line as the circumference of the circle, because any gaps would interfere with the smooth running of the fill routine. In my version it is also possible to have semicircles and arcs at the edges of the screen.

The display list interrupt routine which protects the colours in the text window is based on the one in Peter Budgell's article on Graphics 10/7 in *Analog 14*. I have altered it to fit in with the colour requirement of my program.

```
1 REM GRAPHICS 7 PAINTBOX
2 REM CHRISTOPHER P. JONES
3 REM APRIL 1984
9 REM INITIALISE
10 OPEN #1,4,0,"K:"
20 GRAPHICS 7
25 DIM A$(10),C1$(10),C2$(10),C3$(10),R(
3,2)
35 R(1,1)=0:R(1,2)=0:R(2,1)=0:R(2,2)=0:R
(3,1)=9:R(3,2)=14
36 GOSUB 11000
37 POKE 752,1
38 SETCOLOR 4,8,8:POKE 54286,192
40 GOTO 1000
199 REM MAIN LOOP
200 X=80:Y=40
205 X1=X:Y1=Y:COLOR C:PLOT X,Y
250 GOSUB 800
255 IF PEEK(764)<255 THEN 2500
265 IF S=15 AND FLAG=0 THEN 350
270 IF FLAG=0 THEN 350
280 COLOR B
290 PLOT X1,Y1
295 LOCATE X,Y,B
305 GOTO 205
350 IF ERASE=1 THEN COLOR 0:PLOT X1,Y1
360 GOTO 295
399 REM FILL
400 Y2=Y:X2=X:COLOR C
405 Y2=Y2-1:LOCATE X2,Y2,C1
410 IF C1<>C THEN 405
415 Y3=Y
420 Y3=Y3+1:LOCATE X2,Y3,C1
425 IF C1<>C THEN 420
450 K=Y3-Y2
460 FOR L=1 TO K:X2=X
465 LOCATE X2,Y2+L,C1
470 IF C1=C THEN 500
480 PLOT X2,Y2+L
485 X2=X2-1
490 GOTO 465
500 X2=X+1
505 LOCATE X2,Y2+L,C1
510 IF C1=C THEN 530
515 PLOT X2,Y2+L:X2=X2+1
520 GOTO 505
530 NEXT L
535 POKE 764,255
550 GOTO 1000
599 REM CIRCLE
600 IF Q=1 THEN 610
601 Q=1:D=B:COLOR C:PLOT X,Y:X2=X:Y2=Y:P
OKE 764,255:GOTO 295
610 Q=0
620 R=X-X2:COLOR C
640 FOR N=0 TO 360
645 Z=X2+R*SIN(N)
646 IF Z<0 OR Z>159 THEN 660
647 O=Y2+R*COS(N)
648 IF O<0 OR O>79 THEN 660
650 PLOT Z,O
660 NEXT N
665 COLOR D:PLOT X2,Y2
680 GOTO 1000
800 REM JOYSTICK INPUT
810 S=STICK(0)
815 T=STRIG(0):FLAG=SGN(T)
825 IF S=10 OR S=11 OR S=9 THEN X=X-1
830 IF S=6 OR S=7 OR S=5 THEN X=X+1
835 IF S=10 OR S=14 OR S=6 THEN Y=Y-1
840 IF S=13 OR S=5 OR S=9 THEN Y=Y+1
845 IF X<0 THEN X=0
850 IF Y<0 THEN Y=0
855 IF X>159 THEN X=159
860 IF Y>79 THEN Y=79
895 RETURN
899 REM DRAWTO
900 IF Q=1 THEN 910
901 COLOR C:PLOT X,Y
905 Q=1
906 X2=X:Y2=Y
907 POKE 764,255:GOTO 295
910 X3=X:Y3=Y
911 COLOR C
915 PLOT X3,Y3:DRAWTO X2,Y2
920 POKE 764,255:Q=0:GOTO 1000
999 REM MAIN MENU
1000 ? "}"
1001 FOR K=1 TO 3:SETCOLOR K-1,R(K,1),R(
K,2):NEXT K
1005 POKE 764,255
1010 ? "DRAW(1),DRAWTO(2),ERASE(3),CIRCL
E(4), FILL(5),SCREEN(6),COLOUR(7),PALETT
E(8)SAVE(9),LOAD(0)?";
1015 ERASE=0:LOCATE 80,40,B
1018 FILL=0:DRAW=0
1019 DRTO=0:CIRCLE=0
1020 GET #1,A
1025 IF A<48 THEN 1020
1030 IF A>57 THEN 1020
1040 IF A=49 THEN DRAW=1:GOTO 2000
1050 IF A=53 THEN FILL=1:GOTO 2200
1055 IF A=51 THEN ERASE=1:GOTO 2100
1060 IF A=52 THEN CIRCLE=1:GOTO 2150
1065 IF A=50 THEN DRTO=1:GOTO 2050
1070 IF A=54 THEN 3000
1075 IF A=55 THEN 3500
1080 IF A=56 THEN 4000
1085 IF A=57 THEN 10000
1090 IF A=48 THEN 10500
2000 ? "}"
2005 ? "PRESS BUTTON TO PLOT,HOLD BUTTON
 TO    DRAW,HIT ANY KEY TO RETURN"
2010 GOTO 200
2050 ? "}"
2055 ? "HIT ANY KEY TO ESTABLISH POINTS"
2060 GOTO 200
2100 ? "}"
2105 ? "HOLD BUTTON TO ERASE,HIT ANY KEY
 TO   RETURN"
2110 GOTO 200
2150 ? "}"
2155 ? "HIT ANY KEY TO ESTABLISH CENTRE
AND   RADIUS(LEFT-RIGHT)"
2160 GOTO 200
2200 ? "}"
2205 ? "HIT ANY KEY TO FILL AN ENCLOSED
SPACE"
2210 GOTO 200
2500 IF ERASE=1 THEN COLOR B:PLOT X,Y:GO
TO 1000
2505 IF DRAW=1 THEN COLOR B:PLOT X,Y:GOT
```

SOFTWARE *File*

```
0 1000
2510 IF FILL=1 THEN COLOR 0:PLOT X,Y:GOT
0 400
2515 IF DRTO=1 THEN 900
2520 IF CIRCLE=1 THEN 600
2999 REM SCREEN COLOURS
3000 ? "}"
3005 ? "GREY(0),BLUE(1),ORANGE(2),GREEN(
3),   PINK(4),PURPLE(5)?";
3010 GET #1,SET
3011 IF SET<48 THEN 3010
3012 IF SET>53 THEN 3010
3015 IF SET=49 THEN SET=8
3020 IF SET=51 THEN SET=13
3030 SETCOLOR 4,SET,8
3035 GOTO 1000
3499 REM PLOT COLOUR
3500 ? "}"
3505 ? C1$;"(1),";C2$;"(2),";C3$;"(3)?"
3525 GET #1,A:C=A-48
3530 IF C<1 OR C>3 THEN 3525
3535 GOTO 1000
3999 REM PALETTE COLOURS
4000 ? "}"
4005 ? "WHITE(0),BLACK(1),BLUE(2),GREEN(
3),   YELLOW(4),RED(5),ORANGE(6),BROWN(7
)   PICK 3";
4015 FOR K=1 TO 3
4020 GET #1,A:A=A-48
4025 IF A<0 OR A>7 THEN 4020
4030 IF A=0 THEN A$="WHITE":R(K,1)=9:R(K
,2)=14
4035 IF A=1 THEN A$="BLACK":R(K,1)=0:R(K
,2)=0
4040 IF A=2 THEN A$="BLUE":R(K,1)=7:R(K,
2)=6
4045 IF A=3 THEN A$="GREEN":R(K,1)=13:R(
K,2)=10
4050 IF A=4 THEN A$="YELLOW":R(K,1)=15:R
(K,2)=12
4055 IF A=5 THEN A$="RED":R(K,1)=3:R(K,2
)=4
4060 IF A=6 THEN A$="ORANGE":R(K,1)=2:R(
K,2)=8
4065 IF A=7 THEN A$="BROWN":R(K,1)=2:R(K
,2)=2
4071 ON K GOSUB 4600,4700,4800
4075 NEXT K
4080 GOTO 1000
4600 C1$=A$:RETURN
4700 C2$=A$:RETURN
4800 C3$=A$:RETURN
9999 REM SAVE ROUTINE
10000 ? "}":? "PREPARE CASSETTE FOR SAVE
"
10005 SCREEN=PEEK(88)+256*PEEK(89)
10010 OPEN #2,8,0,"C:"
10015 FOR T=0 TO 3199
10020 PUT #2,PEEK(SCREEN+T)
10025 NEXT T
10030 PUT #2,SET
10035 FOR T=1 TO 3
10040 PUT #2,R(T,1):PUT #2,R(T,2)
10045 NEXT T
10050 CLOSE #2
10055 GOTO 1000
10499 REM LOAD ROUTINE
10500 ? "}":? "PREPARE CASSETTE FOR LOAD
"
10505 SCREEN=PEEK(88)+256*PEEK(89)
10510 OPEN #2,4,0,"C:"
10515 FOR T=0 TO 3199
10520 GET #2,A:POKE SCREEN+T,A
10525 NEXT T
10530 GET #2,SET
10535 FOR T=1 TO 3
10540 GET #2,A:R(T,1)=A:GET #2,A:R(T,2)=
A
10545 NEXT T
10550 CLOSE #2
10551 SETCOLOR 4,SET,6
10555 GOTO 1000
10999 REM PROTECT TEXT WINDOW
11000 DIM DLI$(29)
11010 RESTORE 11050:FOR X=0 TO 28:READ I
:POKE ADR(DLI$)+X,I:NEXT X
11020 POKE PEEK(560)+256*PEEK(561)+84,14
1
11030 POKE 513,INT(ADR(DLI$)/256):POKE 5
12,ADR(DLI$)-PEEK(513)*256
11040 RETURN
11050 DATA 72,169,0,141,10,212,141,27,20
8,169,144,69,79,37
11060 DATA 78,141,24,208,169,10,69,79,37
,78,141,23,208,104,64
```

McConverter

Ed Corteen,
Westbury,
Wiltshire.

Spectrum

THIS PROGRAM is designed to convert machine code into data statements which are then ready for publication. I have used the method used by Ian Briscoe in his Windos program.

To use the program simply type it into your Spectrum altering the program to suite. The addition of the interface 1 and Microdrives alters the base address of Basic so use Let Poke =23761 for non-Microdrive users and LET Poke =23819 if the Microdrives are fitted.

The program as listed is self-explanatory. Run the program and you will be presented with the Menu. If your program is a long one it is probably best if you use option 3 first to ensure you don't run out of memory when using Edit to enter copies of line 1000.

Once the program has been run always use Goto g to run. Now use option 1 to initialise the variables. Use Edit to enter copies of line 1000. Use a line interval of 10.

Next use option 2 to check that you have entered enough copies.

Now we come to the interesting part. If you look in the manual page 166, you will see how the lines of Basic are organised. We know the address and length of each line — 119 bytes. Option 4 will read the machine code, convert it to Hex notation and Poke the code into each line. At the same time it calculates the check-sum and this is Poked in at the end of the line. Using Edit to enter copies of line 1000 reserves space at the correct address for your machine code.

This process is quite slow being Basic. It takes about 40 seconds per line. Clever machine-code programmers can convert this.

Once the code has been Poked into each line it can be checked with option 5. To publish your masterpiece simply send off the data lines with the loader program (lines 7200 to 7630) plus any extra Basic lines required. And there you have it — all the hours spent coverting and checking your code have been overcome.

The data lines once "decompiled" can now be anywhere in your completed program. But remember they must be at the beginning of your program while they are being converted. If they aren't you will end up with some very strange looking lines or more likely a crash!

```
1000 DATA "000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
000000000000000",1234
1010 DATA "000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
000000000000000",1234
1020 REM use 100 characters per
line, with 4 characters for chec
ksum
1030 REM use line interval of 10
 for data statements
6000 REM AUTOLINE
6010 REM ED CORTEEN
6020 REM January 1985
6990 REM after running program
use GO TO g to run
7000 LET g=7000: CLS : PRINT "En
ter......"
7010 PRINT "1:To initialise"
7020 PRINT "2:To check number of
 DATA lines"
7030 PRINT "3:To load m/c code"
7040 PRINT "4:To Decompile progr
am"
7045 PRINT "5:To compile program
"
7050 IF INKEY$="" THEN  GO TO 70
50
7060 IF INKEY$="1" THEN  GO TO 8
000
7070 IF INKEY$="2" THEN  GO TO 8
055
7080 IF INKEY$="3" THEN  GO TO 8
500
7090 IF INKEY$="4" THEN  GO TO 8
100
7100 IF INKEY$="5" THEN  GO TO 7
200
7110 GO TO 7050
7195 REM **hex loader**
7197 REM change address as neede
d
7200 CLEAR 58999
7210 LET address=59000
7220 LET line=1000: RESTORE line
7230 FOR a=1 TO line:
  REM **number of DATA lines**
7240 GO SUB 7500
7245 PRINT line;" OK.";
7250 LET line=line+10
7260 NEXT a
7270 CLS : PRINT "Code in memory
."
7280 INPUT "name of code? ";z$:
INPUT "length of code? ";length
7290 SAVE *"m";1;z$CODE address,
length
7300 PRINT "Verifying..": VERIFY
 *"m";1;z$CODE
7310 PRINT "Finished saving ";z$
7320 GO TO 7000
7500 READ a$,checksum
7510 LET total=0
7520 FOR i=1 TO LEN a$ STEP 2
7530 LET high=CODE a$(i)-48
7540 LET low=CODE a$(i+1)-48
7550 LET high=high-39*(high>9)
7560 LET low=low-39*(low>9)
7570 LET byte=(16*high)+low
7580 LET total=total+byte
7590 POKE address,byte
7600 LET address=address+1
7610 NEXT i
7620 IF total<>checksum THEN  PR
INT "Error in line ";line;"."'"c
heck and re-run": STOP
7630 RETURN
7990 REM **initialise**
8000 CLS : PRINT "enter lenth of
 m/c CODE ": PRINT "this must be
 rounded UP to the nearest 50":
 INPUT l
8005 LET x=INT (l/50): REM numbe
r of lines required
8010 PRINT "use EDIT to create "
;x;" copies       of line 1000"
```

(continued on next page)

(continued from previous page)

```
8015 PRINT#0;"press any key to
LIST program": PAUSE 0
8020 CLS : LIST 1000
8040 REM **check number of data
lines**
8050 REM *detects the quote mark
after each data statement**
8053 REM if no microdrive fitted
 LET poke=23761
8055 LET poke=23819: LET line=0
8065 FOR p=poke TO poke+(x+1)*11
9 STEP 119: IF PEEK (p-1)<>34 TH
EN  GO TO 8080
8070 LET line=line+1: NEXT p
8080 PRINT AT 8,0;"you have ente
red ";line ;" copies of line 100
0"
8090 GO TO 7050
8095 REM **decompiling routine**
8100 LET poke=23819: INPUT "star
t of code? ";peek
8110 LET linenumber=990
8115 FOR p=poke TO poke+((x-1)*1
19) STEP 119
8120 LET linenumber=linenumber+1
0: PRINT AT 10,0;"decompiling li
ne ";linenumber
8130 GO SUB 9000
8140 NEXT p
8150 PRINT AT 12,0;"FINISHED!"
8155 PRINT #0;"Hit any key to co
ntinue": PAUSE 0
8160 GO TO 7000
8490 REM **loading routine**
8500 IF poke=23819 THEN  GO TO 8
550
8510 PRINT #0;"prepare cassette
and hit any key": PAUSE 0
8520 LOAD ""CODE
8530 GO TO 7000
8550 CAT 1: INPUT "name of CODE
?";z$
8560 LOAD *"m";1;z$CODE
8570 GO TO 7000
9000 DIM a$(2): LET checksum=0
9010 LET a=p
9030 FOR a=a TO a+99 STEP 2
9040 LET a$=FN h$(PEEK peek)
9050 LET checksum=checksum+PEEK
peek
9060 LET peek=peek+1
9070 POKE a,CODE a$(1)
9080 POKE a+1,CODE a$(2)
9090 NEXT a
9100 DIM c$(4): LET c$=STR$ chec
ksum
9110 FOR f=2 TO 5: POKE a+f,CODE
 c$(f-1): NEXT f
9120 RETURN
9960 REM ***dec-hex converter***
9970 DEF FN k$(x,y)="0123456789a
bcdef"(INT (x/16^y)-16*INT (x/16
^(y+1))+1)
9980 DEF FN h$(x)=FN k$(x,1)+FN
k$(x,0)
9998 ERASE "m";1;"autoline"
9999 SAVE *"m";1;"autoline": VER
IFY *"M";1;"autoline"
```

Hires and Gnasher

Karl Williams,
Swansea,
West Glamorgan.

Oric

HIRES COPY provides a direct screen to printer dumping utility which handles text and graphics on all Oric computers except the 16K machine for which the addresses in lines 10020, 10050, 10060 and 11010 must be altered.

Oric Gnasher is a Pac-man style program following the usual rules and is designed for use on the Atmos although it should run on the Oric-I 48K.

Cursor keys are used to guide your man around the maze. However, points are lost if you retrace your steps which is also dangerous as the ghost follows in your footsteps and gets closer towards the end of the game, the maze has been designed with this in mind.

Moving over the fruit enables you to kill the ghost before the screen returns to normal. The object is to eat all the dots and move onto the pyramid. More screens could be added by using more data after lines 2120 to 2180 with appropriate adjustments in the rest of the program.

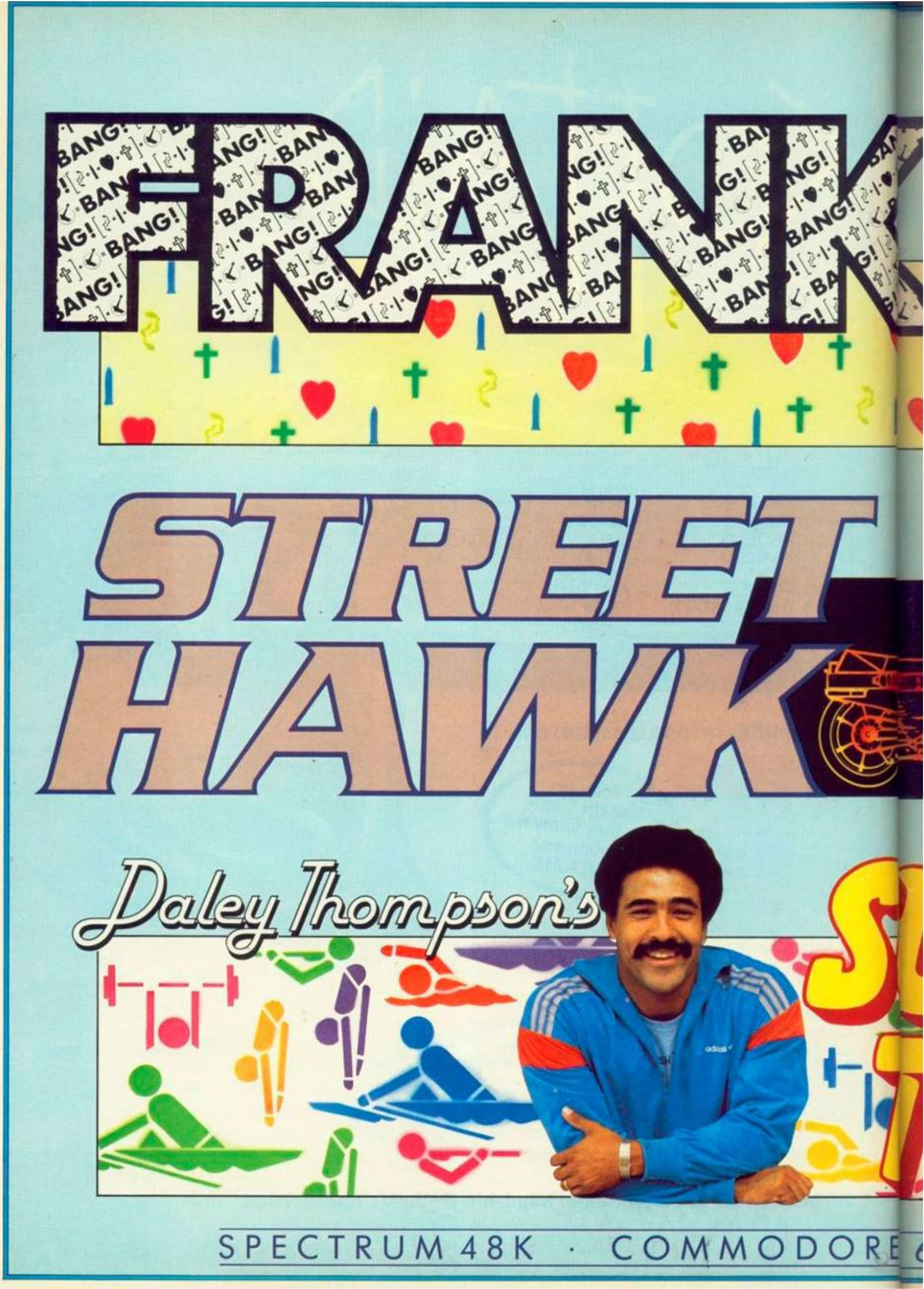
Hire copy.

```
10015 LPRINT CHR$(18):LPRINT"I"
10020 A=£A000
10030 REPEAT
10040 A=A+1
10050 UNTIL PEEK(A)>64 OR A=£BF3F
10060 IF A=£BF3F THEN LPRINT"M0,-400":PING:END
10070 X=PEEK(A)-64
10080 IF X/32>=1 THEN X=X-32:S=1:GOSUB 11000
10090 IF X/16>=1 THEN X=X-16:S=2:GOSUB 11000
10100 IF X/8>=1 THEN X=X-8:S=3:GOSUB 11000
10110 IF X/4>=1 THEN X=X-4:S=4:GOSUB 11000
10120 IF X/2>=1 THEN X=X-2:S=5:GOSUB 11000
10130 IF X/1>=1 THEN S=6:GOSUB 11000
10140 GOTO 10030
11000 REM *PRINTER*
11010 B=A-£A000
11020 CY=INT(B/40)
11030 CX=(((B-CY*40)*6)+S)*2
11035 CY=CY*-2
11040 LPRINT"M";CX;",";CY:LPRINT"D";CX+1;",";CY
11050 LPRINT"M";CX;",";CY-1:LPRINT"D";CX+1;",";CY-1
11060 RETURN
```

Gnasher.

[illegible]


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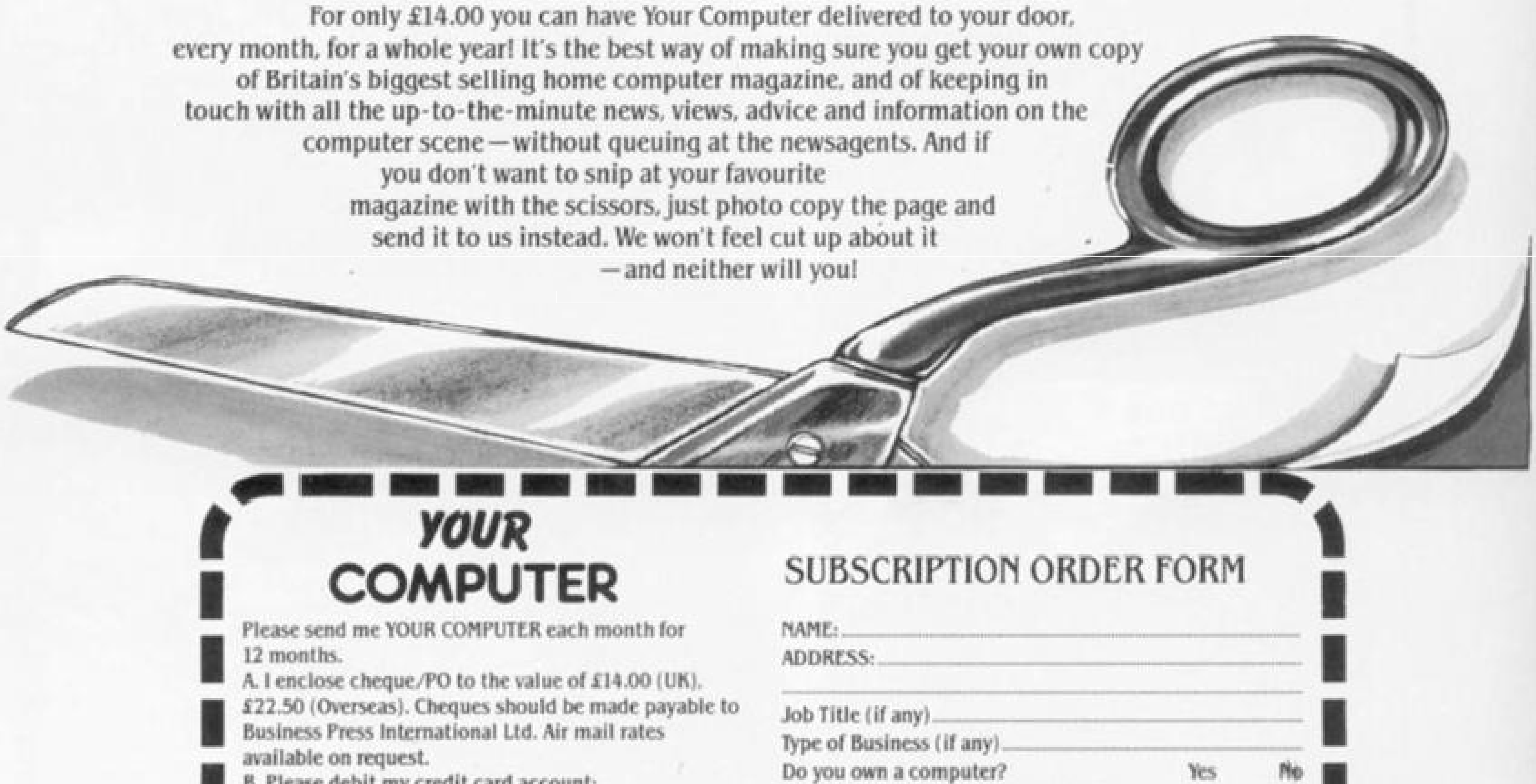
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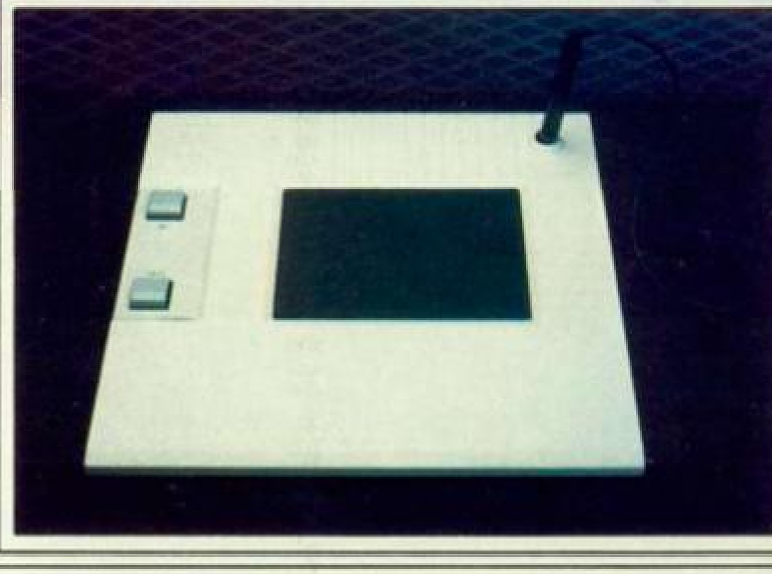
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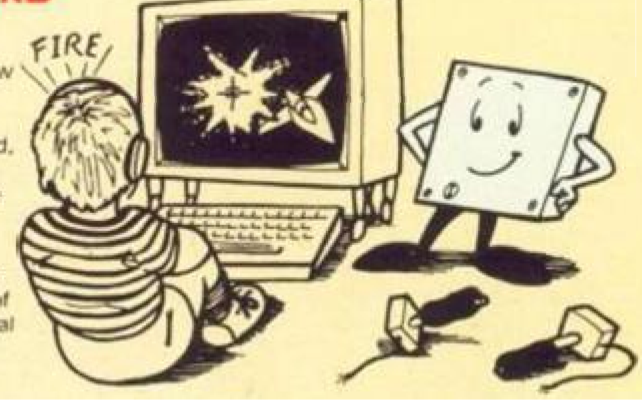




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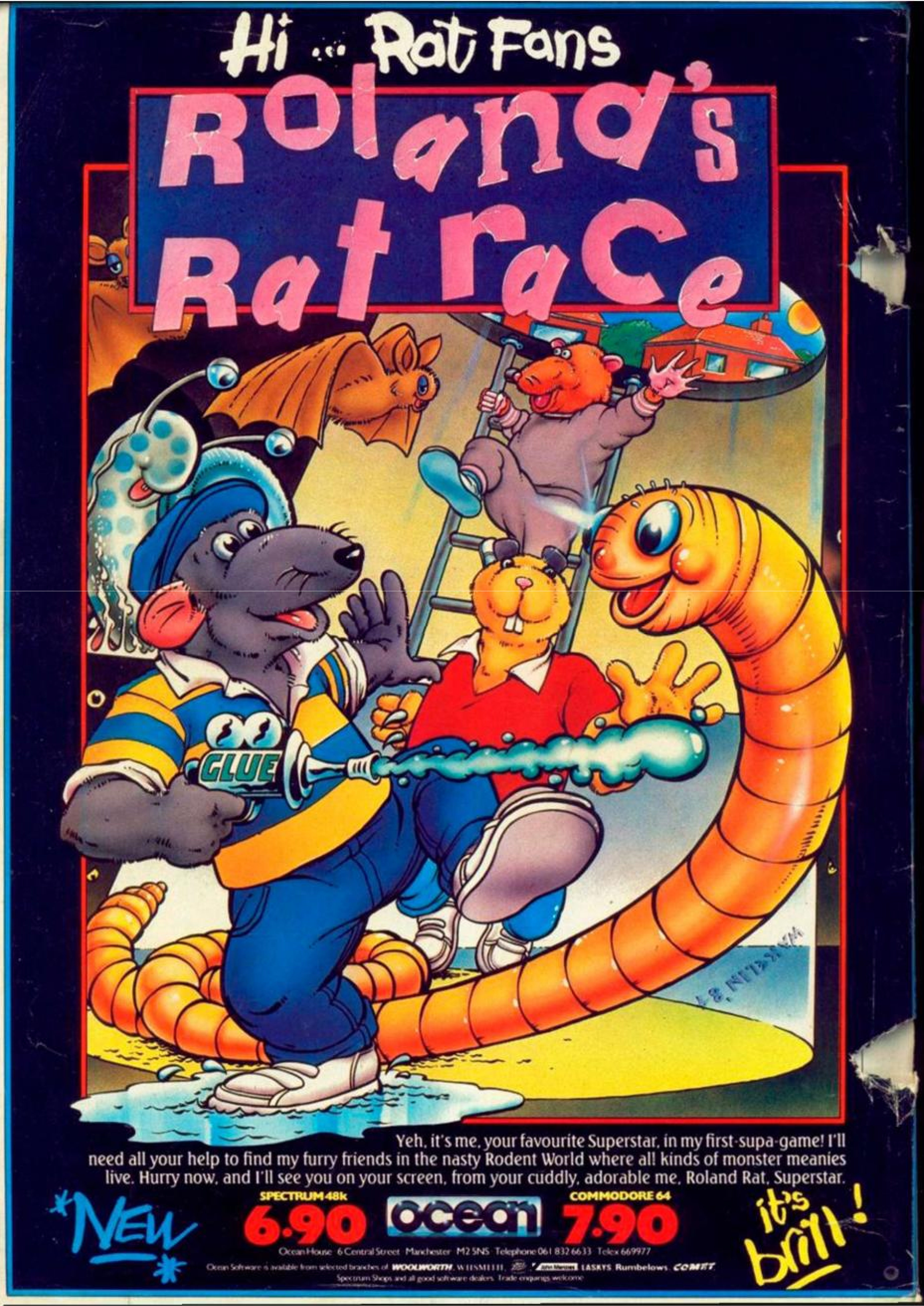
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